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Editor:
F. H. HARLEY

Mining Editor:
H. COOPER, A.M.I.MIN.E.

News Editor:
P. E. CARDEN

Associate Editors:
D. GRIMMER; R. M. HOWSE; B. M. DAVEY; G. L. WARD

District Representatives:
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A. D. H. CURRIE, (Northern) Tel.: Ringway 2452
E. J. SWEETING (Midlands) Tel.: Plumtree 2585
E. G. COLLIS (Southern Area) Tel.: TRAfalgar 6171
T. H. SMITH (Scotland) Tel.: Dumbarton 1046

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Telephone: Trafalgar 6171 (Private Branch Exchange)
Telegraphic Address: "Zacatecas, Rand, London"

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IRON AND COAL
TRADES REVIEW

Vol. 180 February 12, 1960 No. 4,778

Cheaper Steel

THE boom in steel equities during the past six months stems from a variety of causes. So long as the threat of renationalization persisted, investors fought shy of exposing their capital to the hazards of meddlesome political doctrinaires, but once that fear was dispelled by the verdict of the October General Election, there developed a stampede to participate in the supposedly fat profits of an industry which was then emerging from a prolonged period of depression.

To some extent this ascent into the financial empyrean was based on a fallacy: the mistaken idea that steel was restored to complete mastery in its own house. It cannot too often be reiterated that the steelmakers are not free to do just as they please.

As we have seen in recent months, their development schemes are all carefully vetted by the Iron and Steel Board; they must submit to official guidance in the location of new enterprises, and above all the board, not the manufacturers, determines the maximum prices of nearly all iron and steel products.

Against these safeguards of the national interest, some of which have been enforced for more than a quarter of a century, the industry makes no complaint. It is recognized that in its price determinations the board consistently seeks to mete out equal justice to producers and consumers alike. This point is very shrewdly emphasized in the official statement which accompanied the announcement of the cut in the maximum prices of heavy steel products, tinplate, and hematite pig-iron which came into operation on Monday. Therein it is repeated that the board's price policy is that "in an expanding industry, prices should reflect the costs of production and reasonable capital charges at new plant incorporating the most modern techniques, favourably situated for raw materials and markets, and operating at a high degree of efficiency." In short, steel companies cannot expect to earn profits by obsolete methods or obsolete plant.

Acting upon that principle, the board's recent investigations have led to the conclusion that for the third time in the space of less than two years, specified types of steel products could be sold more cheaply without detriment to the long-term interests of the producers, and with obvious advantage to the principal consumers of heavy steel, such as shipbuilders and constructional engineers. The price variations amount, in the aggregate, to a saving of several millions of pounds in the nation's steel bill, and, above all, the fact that reductions on this scale are possible without detriment to the long-term interests of the industry is a triumphant vindication of the huge expenditure on new equipment and the progressive policy of the industry in the development of new techniques.

Judged by any standard, the progress of the steel industry is quite outstanding. During a period of persistent inflation, steel is one of the few British manufactures which have become substantially cheaper, although the individual earnings of the workers have continued to rise. The net result is that United Kingdom steel prices are substantially lower than those ruling in the United States, and, for corresponding products in open-hearth qualities, are generally below those ruling on the Continent.

These are substantial advantages which promise a further advance in the prosperity of British steel. Nowadays, oversea trade does not necessarily "follow the flag," but it does tend to gravitate to the cheapest market. This trend is clearly visible in the swelling volume of British steel exports. Clearances to oversea destinations last year have only once been exceeded—in the boom year of 1957—and the industry looks confidently forward to the attainment of new export records in 1960.

This should gladden the heart of the Chancellor of the Exchequer, who in his latest analysis of the state of the national economy has emphasized the need, transcending all others, for a further substantial expansion of our export trade.

Modernization Marks Shipyard Centenary

COMPLETION of a major modernization scheme, which has cost several million pounds, will mark the centenary next month of the Neptune shipyard, Newcastle-upon-Tyne, of Swan, Hunter, & Wigham Richardson, Limited. The yard was founded in March, 1860, by John Wigham Richardson, then aged 23, who was eager to become a shipbuilder. Although at first the business went through difficult times, in 1872 the Neptune engine works was added to manufacture marine engines and boilers for vessels built at the yard.

When the yard was established it covered only four acres and had a river frontage of about 300 ft. Now, the yard area is increased sevenfold and its frontage extends over 1,800 ft. The yard has built up a high reputation for the construction of cable ships and 23 such vessels have so far been built there.

Another event to mark the centenary year will be the launching in September of the 20,000 tons gross Portuguese passenger liner Principe Perfeito, the biggest ship yet built there.

Passing Thoughts . . .

MR. R. F. SUMMERS

WE, ourselves, would like a pause in the expansion programme, but it is doubtful whether we will be allowed to. To stand still is, in effect, to slip back, and that, of course, must not be allowed to happen.—MR. RICHARD F. SUMMERS, chairman, replying to a question about future development at the annual meeting of John Summers & Sons, Limited, the Shotton (Ches) steelmakers.

Sir Alexander [Fleck] is nobody's idea of a tycoon. He speaks much as he must have done at the Glasgow Tech. in 1904.—*London Letter in The Guardian.*

Peams are the perks and expense account men and it is increasingly they who are setting the status-scramble pace. Anyone who uses his eyes and ears knows that peamery is an established institution. It gives a concealed start in cash and kind in the status race to a limited number of competitors—those in certain positions and at certain levels of commerce and industry. This puts the other middle-class scramblers, the fixed salary only earners at a considerable disadvantage.—DR. JOHN HIGHET, Lecturer in Sociology, Glasgow University.

For three weeks during the very cold spell this Thames-side village [Cookham, Berks] of some 4,000 *inhabitants was without any coal. I made inquiries as to the cause and ascertained that the coal was lying in railway trucks at Banbury, etc., waiting for bureaucracy to blow the whistle.—Letter in the Daily Telegraph.*

We read of closed pits in South Wales. Yet my coal merchant cannot supply me with 5 cwt. of anthracite. It has been on order since December 16.—Letter (from Claygate, Surrey) in the News Chronicle.

Men in the top jobs never have dirty shoes or long hair. You need short hair to be a success. BARBARA CARTLAND.

Stanley Baldwin did not seem to like talking with his own rank and file, though he enjoyed long talks on the terrace with Labour members, especially miners.—EARL ATTLEE, in an article in The Observer.

The collier dog, trained to bury surplus coal.—One of six breeds you won't *see at Cruft's, according to Thelwell, the News Chronicle cartoonist.*

Chilly royal news for the coal industry: the workmen are moving in to convert the Windsor Castle central heating from coke to an oil-fired system. . . . In view of all the talk of coal surpluses, and miners' union boycott of oil-fired premises, this is an inflammatory move. But the coal interests are taking it like loyal subjects.—"Londoner's Diary," in the Evening Standard.

Robert Asquith [chairman of William Asquith, Limited, the machine-tool makers] is a stocky, emphatic, dynamic Yorkshireman who works at speed and lives at the same speed out of working hours.—"MAMMON," The Observer.

Suppose I'm worried about matters industrial. Suppose there's a problem of which I cannot see the solution. I might say to my wife "Shut that damn thing off" (meaning the television set), and then sit down at the piano and play all the tunes I knew so well in my youth. I find, of course, that I can't play them nearly so well now, and so I go to bed worrying about my music. More serious affairs are utterly forgotten. —SIR WILLIAM SCOTT, president of the North-East Coast Engineering Employers' Federation, quoted in an article in the Newcastle Journal.

It has been said that an Englishman's home is his castle, but in Sowerby Bridge an Englishman's home is the happy hunting ground for Health Committee officials and members of the Gas Board.—CLLR. CHARLES MAUDE, *at a meeting of Sowerby Bridge (Yorks) Urban Council, when a smoke-control area plan was deferred for* 12 *months.*

They [the NCB] tell me that "Coalite" is reserved for smokeless zones. Does this mean that with more and more areas following the enlightened lead of those who are already smokeless, we shall be faced with a new fuel crisis? And if so, should not something be done now to ensure an adequate supply of smokeless fuel both for those who are forced to use it and for those who are sufficiently socially conscious to believe in it?—Letter in The Guardian.

Press photographs this week showed housewives in a Paris suburb lining up to purchase consignments of coal from a slot machine. For three heavy francs they can collect about 16 *pounds of pre-packaged coal. To be fair to the National Coal Board they anticipated the French by making packaged coal available in a number of Scottish towns. But as yet we cannot in Scotland buy coal from slot machines, possibly because we don't have any heavy francs.— The Scotsman.*

The leaders of the trade union movement see their main responsibility today as one of ensuring that the people whom they represent get the biggest possible slice out of an ever-expanding cake of wealth. The danger is that, if we are all too greedy, the cake itself will be destroyed.—Yorkshire Post.

From November 30, 1959, *to January* 30, 1960, 359 *wagons of coal were despatched from various collieries to Reading station. Analysis of the transits disclosed that of the* 315 *wagons which arrived,* 13 *were one day,* 34 *two,* 34 *three,* 25 *four,* 44 *five,* 38 *six,* 29 *seven,* 21 *eight,* 16 *nine,* 18 *ten,* 7 *eleven,* 7 *twelve,* 6 *thirteen,* 7 *fourteen,* 5 *fifteen,* 1 *sixteen,* 4 *seventeen,* 1 *nineteen,* 2 *twenty,* 1 *thirty-four,* 1 *thirty-five, and* 1 *thirty-nine days en route. Forty-four wagons, which had been en route for varying periods from* 1 *to* 24 *days, were yet to arrive.—Letter in The Times.*

SOME 50 MANAGERS of the Morgan Crucible Company, Limited, London, S.W.11, are to be sent on a computer course during the next six weeks. The company regards the better handling of information as a means to improved efficiency and one of the methods chosen is the use of a digital computer. Two-day courses have been arranged for the managers by International Computers & Tabulators, Limited. Executive directors of the company have also recently attended a computer course.

STEEL PRICE REDUCTIONS

Heavy Joists and Sections Down by 20s.

HIGHER outputs in the steel industry mean a lower capital cost per ton of production, and the Iron and Steel Board takes the view that some reduction in prices is due. It has therefore cut the price of hematite pig-iron by 15s. per ton and of heavy steel sections by 20s. The reductions came into effect on Monday. The combined result is an overall reduction of 2½ per cent. to 3 per cent. in the general level of steel prices.

The reduction of 15s. in hematite brings the maximum price of North-East Coast iron down to £23 19s. per ton. The extras relating to basic pig-iron are amended, but there is no change in prices of foundry iron.

The reductions in steel products are:—Heavy steel plates, 10s. a ton; heavy sections and joists, 20s. There is an average reduction of 20s. a ton in tinplate, according to specification. Moreover, the increase averaging 8s. a ton of tinplate which would otherwise become due on April 1 following the recent rise in tin prices will not be applied. Prices of re-rolled steel are generally unchanged.

The Iron and Steel Board's price policy, as expressed in the annual report for 1957, is that "in an expanding industry prices should reflect the costs of production and reasonable capital charges at new plant, incorporating the most modern techniques, favourably situated for raw materials and markets, and operating at a high degree of efficiency."

Since June, 1959, when the prices of most iron and steel products were reduced, the costs of ore, scrap, fuel, transport, and labour have remained broadly unchanged, but the rising demand for steel has led to the use of a higher proportion of pig-iron in relation to scrap in steelmaking, and as pig-iron is the more expensive material there has been a rise in production costs. Against this, experience has shown that modern plants are capable of greater outputs than were previously assumed. In consequence, the capital cost per ton of output is lower. It is the board's view that this has rather more than offset the higher production costs and thus enables certain prices to be reduced.

The Iron and Steel Board points out that UK prices are substantially lower than those ruling in the US and, for corresponding products in open-hearth qualities, are generally below those ruling on the Continent. Thomas qualities of steel on the Continent are generally cheaper than UK open-hearth qualities.

RAILWAY TRACTION DEPARTMENT of Rolls-Royce, Limited, has moved from Derby to Shrewsbury, where the company has its oil engine division factory. The department will continue to make engines at Shrewsbury and transmissions at Crewe. Rolls-Royce also announces that since 1956 it has built more than 1,000 engines for railcars and locomotives—about half for Britain Railways and others for Australia, Canada, Malaya, New Zealand, and Sweden.

Chancellor Warns Men and Management

EXCELLENT results achieved last year had not provided a cornucopia into which they could freely dip without regard to the sum total of their claims, said Mr. Heathcoat Amory, warning both sides of industry that unless they co-operated in keeping costs down he might be forced to take stronger measures to prevent inflation. Speaking at a meeting of the National Production Advisory Council for Industry last Friday, the Chancellor stressed the importance of maintaining a balance in the economy.

The benefits of higher productivity should not be absorbed entirely by increases in either wages or profits, but should be shared with the consumer. Price reductions would do far more to consolidate present prosperity than higher profit margins and dividends. The steel industry was to be complimented on its price reductions—a token, he thought, of "more to come."

Speaking to the trade unions with "the utmost gravity," Mr. Amory said they must not delude themselves that reductions in working hours for the same pay were not the equivalent to an increase in wage rates. A reduction in the working week from 44 hours to 42 without loss of pay put up the hourly wage rate by nearly 5 per cent. and if the same actual hours were worked as before the wage bill would rise by as much as 6 or 7 per cent., depending on the rate of overtime.

Over the last 10 years the actual annual increase in real output per worker had averaged only about 2 per cent. While they could hope for a rather higher figure in the future as a result of the large increase in investment in recent years it was clear that if annual settlements were made on a scale going beyond the increases in productivity they would outstrip the country's likely increase in real wealth and endanger its hard-won price stability.

In the discussion which followed the special claims of the north-east coast and parts of Scotland for new job opportunities were stressed. Mr. W. E. Jones, president of the NUM, spoke of the low level of distributed coal stocks. On the question of the use of oil in power stations he was reassured by Mr. Richard Wood, Minister of Power, that the Government was currently negotiating with the oil companies on this matter, the outcome of which could be to coal's advantage.

PADLEY & VENABLES, LIMITED, manufacturers of pneumatic tools, etc., of Dronfield, near Sheffield, is to extend its works and re-site the main forge.

Coal Output Increasing

OUTPUT of deep-mined and open-cast coal last week, at 4,102,900 tons, showed a slight increase on the previous week, but was 325,000 tons below the comparable 1959 figure. This, however, is hardly surprising in view of the collieries closed and the contraction in manpower. The number of faceworkers is about 9 per cent. down on last year and overall there has been a reduction of 7.5 per cent. in manpower. Output per manshift at the face rose again in the week ended January 30 to 77.82 cwt., compared with 73.98 cwt. a year ago and 77.3 cwt., the average so far this year.

In the week ended January 30 stocks held by the public services and industry showed a slight upward turn, but merchants were still drawing heavily on their stocks and failing to replace them, probably because of transport and labour difficulties. Undistributed stocks again fell and are now down to 34,692,000 tons.

There were 629,300 wage-earners on colliery books on January 30, against 680,000 on January 31, 1959, the numbers engaged at the coal face being 240,800 and 265,000, respectively. Total absenteeism (all workers) in the week ended January 30, was 14.52 per cent., compared with 14.96 per cent. in the week ended January 31, 1959. Output at the face was 3.891 tons and overall 1.386 in the week ended January 30, compared with 3.699 and 1.352 in the week ended January 31, 1959.

The following table gives (in tons) the output of saleable mined coal by division in the week ended February 6, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

Division.	Week ended February 6, 1960.		Week ended February 7, 1959.
	Total output.	Tonnage lost.	Total output.
Scottish	377,900	3,700	386,100
Northern (N & C) ..	243,400	—	274,300
Durham	469,200	—	484,000
North-Eastern ..	858,200	7,500	900,500
North-Western ..	277,500	1,000	305,000
East Midlands ..	931,400	—	952,500
West Midlands ..	299,300	13,700	334,700
South-Western ..	413,500	11,200	431,300
South-Eastern ..	33,200	—	34,400
Great Britain—			
Deep-mined coal..	3,903,600	37,100	4,102,800
Other deep-mined (including licensed mines) ..	51,200	—	58,100
Open-cast coal ..	148,100	—	267,400
TOTAL	4,102,900	37,100	4,428,300

CLYDE YARD IS TO BUILD DE LAVAL ENGINES

LICENCE has been taken out by Alexander Stephen & Sons, Limited, Linthouse, Glasgow, from Turbin Aktiebolaget De Laval Ljungstrom to build De Laval marine steam turbine machinery at its shipyard and engine works.

The company has acquired exclusive rights of manufacture in Scotland, and non-exclusive rights of installation in any ships being built or repaired in the United Kingdom and British Commonwealth except Canada, and for ships being built or repaired for British owners in countries other than North America, Sweden, and the Philippines.

Derbyshire Miners' Output Advances Pit Closures

DERBYSHIRE miners had worked themselves out of a job by proving themselves the best men in the country, said Mr. Bert Wynn, Area secretary of the National Union of Mineworkers, on Sunday. Addressing members in the No. 5 Area of the East Midlands Divisional Coal Board, Mr. Wynn said that their output had brought forward the date of closure of some collieries by two years.

"I warned you all at the meetings last year that you might have to face this," he said. "The exhaustion of the seams in this area was inevitable." The NCB planned "no more stocking" in 1960, so the coal output in the future was in the hands of the market. "And there are no signs of an increase in demand," Mr. Wynn went on.

He said that the outcome would be the immediate closure of Langley Colliery, and by December—"as sure as night follows day"—300 men in the Stanley area would be distributed elsewhere. It had been expected that Woodside, Stanley, and Langley collieries would certainly be closed by 1965, and that the manpower at Denby Hall would have decreased, bringing the total in the area to 5,000 by that time. "But by your output you have brought that date forward by two years," he added.

Mr. Wynn said that a total of 300 men would finish in the near future at Denby Hall and Denby Drury Low collieries alone, in order to cut production. He hoped that the decrease in manpower at these two pits could be achieved through normal channels of retirement and natural wastage with voluntary transfers to other pits absorbing the surplus. It was likely, he went on, that the new Bevercotes Colliery would soon be open and that further developments later in the year would attract a large number of men.

"But there is no incentive for the older men in the area to make the move," Mr. Wynn said. "They may be offered lower-standard work at a lower rate, but who would accept that?" The new Cotgrave Colliery, which he felt would have been a better proposition, might not be in operation until 1964. "People are going to get hurt and there will be a lot of heartbreak before this matter finally settles down."

Mr. Wynn added: "The Coal Board says that we should be like a doctor and not tell you that you have cancer; but we don't agree with that. We think that you ought to know—you are the men to be materially affected. Their futures are safe, yours are not."

Fatal Injury at Welbeck Colliery

AFTER 18 months out of the mines following an accident at a Scottish pit, Mr. Peter Williamson Nelson (43) started work at Welbeck Colliery, Cuckney (Notts). A fortnight later he was fatally injured. At the Warsop inquest on Monday the jury returned a verdict of Accidental Death. A workmate, Mr. Robert Swinn, said that while engaged on packing at the face he found Mr. Nelson unconscious and badly injured. An 8-ft. wing bar which he had been using was caught in the moving conveyor belt and was bent.

Mr. Eric Walvin, a deputy at Welbeck, said it could only be assumed that Mr. Nelson was lifting the wing bar over the conveyor belt. Had he been in any doubt about the safety of the operation he could have stopped the belt. The coroner, Lt.-Col. H. J. Thompson, said that Mr. Nelson himself could have stopped the moving belt and there was no blame attached to anyone else.

In Parliament

Coal Under Fire

MINISTER HANDLES TORY BACKBENCHERS

THE Lt.-Col. Walter Bromley-Davenport—Mr. Gerald Nabarro Conservative backbencher partnership continued its attack on the coal industry in general and the National Coal Board in particular at Question Time on Monday. COL. BROMLEY-DAVENPORT again suggested that the miners' increase in output per manshift was not enough, MR. NABARRO again probed with questions on finance, and Labour's MR. FREDERICK LEE again rallied to the Minister of Power's defence of the industry, the miner, and the NCB.

First volley was discharged by the colonel, who wanted to know the percentage increase in mine mechanization since nationalization and the percentage increase in production per miner per underground shift for the same period. The MINISTER OF POWER, Mr. Richard Wood, said between 1947 and 1958 the percentage of coal mechanically cut increased by 14, that mechanically conveyed by 19, that mechanically cleaned by 15, and that power-loaded by 24. O.M.S. underground increased by 12 per cent.

After so much money had been spent on mechanization was the Minister satisfied with this increase in productivity? COL. BROMLEY-DAVENPORT asked. "Does he think the taxpayer has had a really good return for his money?" It would be impossible—and wrong—to expect an exactly proportionate increase in productivity, the MINISTER replied. O.M.S. had increased from 1.44 tons to 1.69 tons since nationalization and he thought that very satisfactory. Mr. Lee added that as a result of mechanization British coal was now the cheapest in western Europe and the capital invested in the mechanization of the coal mines represented a very good investment for the nation.

Deterioration of Stocks

MR. NABARRO opened his fusillade by asking about stocks and was told that of about 35,000,000 tons of undistributed stocks about 16,000,000 tons was unwashed and unscreened. "And what is to be the ultimate fate of this unsaleable, unwashed and unscreened coal?" he asked. "Its ultimate fate is that it will be sold," the MINISTER replied.

What estimate had the Minister made of deterioration of undistributed stocks? MR. NABARRO went on. The average loss of calorific value in a year was not more than 1 per cent., said MR. WOOD. This loss together with degradation and expense of lifting and marketing was allowed for by the board in its valuation of stocks.

A very large sum of money was involved—was the NCB conforming in its valuation of stocks to the best accountancy practice which required that the stocks should be put into the accounts at cost or market value, whichever was the lower? "I should not like to think that the board is 'cooking the books'," MR. NABARRO said. MR. WOOD said the value of coal stocks was £115,000,000 with £26,000,000 for undistributed coke stocks. The board was quite convinced that it had written down the value of its stocks sufficiently to cover the cost of stocking and eventual sale.

Still on finance, MR. NABARRO then asked what estimate the Minister had made of the trading losses of the board during 1960, after taking fully into account the board's costs entailed in continuing undistributed coal stocks.

The board's "Revised Plan for Coal" made clear its objective to secure a substantial reduction in the accumulated deficit over the whole period from 1960 to 1965. He was not prepared to go beyond this or to give forecasts for individual years, the MINISTER replied.

Coal to Northern Ireland Too Dear and Too Poor

COST and quality of coal sent to Northern Ireland was raised by MRS. PATRICIA MCLAUGHLIN (Ulster Unionist), who said that by the time f.o.b. and other charges were added the pithead cost was doubled by the time the coal arrived at the consumer's bin. Why was the Ayrshire coal contract summarily removed to the east Midlands? she asked. Was that policy to continue? "We appear to have no choice as to where the coal shall come from. It is too dear, and, in many cases, too poor."

The average Ulster family, Mrs. McLaughlin continued, liked to enjoy an open fire; it was a traditional part of their way of life, but the fashion in coal fires could fall off very quickly—so quickly, in fact, that it could never be retrieved. Pleading for special consideration Mrs. McLaughlin said: "We must import all our fuel. If the Minister wants us to use coal we shall have to have some help, because, I can assure him, a change is coming in our fuel consumption."

Putting the Ayrshire point of view MR. ARCHIBALD MANUEL (Lab.) criticized the transfer of the Northern Ireland coal contracts to the east Midlands and said the cost of transport to the port of shipment was nearly three times as much from east Midlands as from the Ayrshire coalfield.

Northern Ireland was part of the home market and had that market's advantages and disadvantages, MR. JOHN C. GEORGE, Parliamentary Secretary to the Ministry of Power, replied. The Ayrshire contract had nothing to do with household coal and it was

purely a transfer of industrial coals for one customer from Ayr to another port. Even with the switch the latest figures showed that stocks in the east Midlands were 10,540,000 tons, in Scotland 1,350,000 tons, and in Ayrshire 84,000 tons.

The NCB must be allowed to operate the industry as a whole and to see where the best advantage lay at any given time. Coal prices had been steady for two years and he was surprised Mrs. McLaughlin had not raised the point before now. She had asked about a higher quality coal for Northern Ireland—there was no general demand for it. It sought Group 5 coal and was reluctant to take any other.

Regarding quality, Mr. George said other qualities could be supplied—at higher prices—if they were asked for. The only hope for better quality coal for Northern Ireland at cheaper freight rates was when the new Scottish pits began to help to close the present gap in supplies.

SHIPBUILDING NEEDS

SPEED was becoming a factor in the situation which confronted the shipbuilding industry, said MR. JOHN RANKIN (Lab.) pointing out that during the last 15 to 18 months the number of persons employed in the industry had decreased from 210,000 to 190,000. That created a feeling of uncertainty and was producing instability in the yards.

MR. ERNEST MARPLES, Minister of Transport, said he had discussed current problems facing the industry with the Shipbuilding Conference and the Shipbuilding Advisory Committee on which both sides of the industry were represented. Great Britain was now second in the world for shipbuilding—"which is something"—and in the last weeks of 1959 100,000 tons of new orders were placed in the UK, including some foreign orders.

The north-east had an order for the largest passenger ship for which an order had been placed in recent years, he told MR. EDWARD SHORT (Lab.), who had said that the position was quickly deteriorating in the north-east.

FUEL OIL

ANNUAL production of fuel oil from UK refineries had increased since 1953 by 5,000,000 tons and annual inland consumption of fuel oil increased by 10,000,000 tons, MR. RICHARD WOOD, Minister of Power, told MR. WOODROW WYATT (Lab.). The latter said that it was clear the difference must have been made up by imports of fuel oil and the Government had been trying to conceal this from the public for the last two or three years.

That was not the conclusion at all, the Minister replied. In 1953 several post-war refineries came into operation for the first time and for some time their capacity greatly exceeded the demand. Throughout the period, production in UK refineries had exceeded consumption.

DSIR INQUIRIES

ASKING whether inquiries were being instituted by the Department of Scientific and Industrial Research into the printing-machine, textile-machine, and shipbuilding industries, MR. AUSTEN ALBU (Lab.) said that informed opinion believed there were many sections of the mechanical engineering industries in this country still in the steam railway age. Too little scientific research and development was done and too few scientific staff and qualified engineers were employed. The situation might become increasingly serious when the present boom in motor-car exports declined.

SIR DAVID ECCLES, Minister of Education, replying for the Minister for Science, said the research needs of the industries mentioned were being considered for special study by the DSIR. He went on to tell Mr. George Brown (Lab.) that there could not be a satisfactory inquiry without the full co-operation of the firms concerned and that co-operation was more likely to be forthcoming if the inquiries were on a confidential basis.

MR. BROWN: "In that case what is the use of an inquiry if nobody knows what it finds?"

SIR DAVID: "The report is afterwards discussed by the industry and steps are taken to remedy the defects."

DECLINING COAL EXPORTS

THERE were potential markets in South America and Japan for coal if only the National Coal Board would give the necessary guarantees to the purchasers and the Ministry of Power could assist by giving a directive to the board to that effect, said MR. ALBERT ROBERTS (Lab.). There were several reasons for the decline in coal exports, the MINISTER OF POWER, Mr. Richard Wood, replied. He hoped that to a certain extent they would be overcome in the years ahead.

One of the reasons for the decline was Polish competition—as had happened in the 30s, MR. JAMES GRIFFITHS (Lab.) maintained. It was not fair competition, but subsidized by the Polish Government in the desperate desire to get foreign currency. Had the Minister had any consultations with Polish Government representatives in order to deal with this serious problem? he asked. MR. WOOD said he would make inquiries about the Polish Government, but he knew steps had been taken with a number of governments abroad to try to increase coal exports.

MR. ROBERTS repeated that some oversea countries were offering much more substantial guarantees than the NCB was prepared to give and that was one of the primary causes of Britain losing coal markets abroad.

COST OF SUBSIDENCE

REPLYING to MR. EDWIN WAINWRIGHT (Lab.), MR. JOHN C. GEORGE, Parliamentary Secretary to the Ministry of Power, in a written answer, said that the cost to the National Coal Board of surface damage in each of the years from vesting to January 3, 1959, was as follows:—1947, £600,000; 1948, £900,000; 1949, £1,200,000; 1950, £1,400,000; 1951, £1,800,000; 1952, £2,300,000; 1953, £2,600,000; 1954, £2,600,000; 1955, £3,100,000; 1956, £3,500,000; 1957, £4,300,000; 1958, £4,300,000; total, £28,600,000.

Costs in the years 1951 to 1957 inclusive were net after receiving from the Exchequer grants totalling £1,900,000 over the period under Section 11 of the Coal Mining (Subsidence) Act, 1950.

ONE MEMBER of the National Coal Board would reach his 65th birthday shortly before his present appointment ended, said the Parliamentary Secretary to the Ministry of Power in reply to Mr. Harold Neal (Lab.).

ON JANUARY 23 the East Midlands Divisional Coal Board held 10,500,000 tons of coal in stock, 3,800,000 tons more than on January 24, 1959. The level of undistributed stocks was at present declining.—The Parliamentary Secretary to the Ministry of Power in a written reply to Mr. Bernard Taylor (Lab.).

DWINDLING STATE-OWNED STEEL

ISHRA's Report for 1958-59

BY September 30, 1959, the Iron and Steel Holding and Realization Agency had reduced the number of nationalized steel companies from 71 in 1953 to 12. In terms of employment, steel production, and sales of products it is estimated that about five sixths of the agency's inheritance has been disposed of. Richard Thomas & Baldwins, Limited, and the Staveley Iron & Chemical Company, Limited, represent about two thirds of the balance remaining with ISHRA. These details are given in the agency's sixth annual report.

Some idea of the change which has taken place in the financial position of the agency since it took over in 1953 is given in the report. This shows that securities in subsidiary companies in 1953 of £252,300,000 have been reduced to £41,000,000 at the end of the last financial year. Loans by the corporation agency to subsidiaries have dropped from £57,400,000 to £6,800,000 and with £125,200,000 in debentures, loan stock, and preference shares in companies which have ceased to be subsidiaries (nominal value £158,000,000) and £18,500,000 loan to the Steel Company of Wales, Limited, current investments are £191,500,000, compared with £309,700,000 in 1953.

The agency's obligations in 1953 included that as guarantor to repay £39,500,000 advances by the Finance Corporation for Industry, Limited, and that as guarantor of £15,100,000 of 3 per cent. debenture stock, 1952-57 of the Steel Company of Wales.

Its obligation on September 30 last year was to make further advances of £21,500,000 to SCOW. Together, investments and obligations in 1953 were £364,300,000 and last year £213,000,000 —a reduction of £151,300,000.

The RTB Project

The most important development project approved by ISHRA during the year was that involving the construction of the integrated steelworks at Llanwern, Newport, by Richard Thomas & Baldwins, the estimated cost of which was £17,000,000. The provision of an electric furnace and two continuous casting machines at the Barrow Steel Works, Limited, at an estimated cost of £1,250,000 was interesting in that it represented a departure from the traditional method of producing billets.

In July, 1959, the agency accepted the recommendation of directors of the Normanby Iron Works Company, Limited, that the blast furnaces of the company should be permanently blown out. The company was placed in voluntary liquidation on August 26.

The agency's liability to repay loans made to the corporation or agency by their subsidiary companies of £39,684,000 at July 13, 1953 (owing to 41 companies), had been reduced to £2,150,000 by September last year (owing to three companies). The policy of assisting subsidiary companies financially when necessary for development or for working capital or to offset losses was continued, but due mainly to disposals, loans amounting to £57,389,652 in 1953 to 25 companies had been reduced to £6,790,652 to six companies last year, after writing off as irrecoverable £2,501,533.

The gross realization proceeds from the sale of the whole or part of the securities of the 50 companies and from the liquidation of one company amounted to £238,800,000, of which £224,800,000 came from the sale of securities and £14,000,000 from companies as the result of reorganization prior to disposal, or the redemption of loan capital, or from proceeds of liquidation. ISHRA retained £173,700,000 for investments to facilitate disposals, for repayment of loans, and for further advances. The sum of £65,100,000 was paid to the Treasury on capital account.

Prior charge interest is still held in the following companies:—Colvilles, Limited; Consett Iron Company, Limited; Darlington & Simpson Rolling Mills, Limited; Dorman Long & Company, Limited; Guest, Keen & Nettlefolds (South Wales), Limited; Guest Keen Iron & Steel Company, Limited; John Summers & Sons, Limited; Steel Company of Wales, Limited; Stewarts and Lloyds, Limited, and the United Steel Companies, Limited.

USINOR Acquires Sole Control of Dunkirk Steel Mill

FRANCE's biggest steel producer, Union Sidérurgique du Nord de la France (USINOR), has bought up sole control of the Société Dunkerquoise de Sidérurgie. The latter firm is at present erecting a coastal steelworks at Dunkirk. The other firms interested in the Dunkirk project were the French steel concerns Ateliers et Forges de Firminy and Forges de Chatillon, Commentry et Neuves-Maisons and the banking firm Banque de Paris et des Pays-Bas. Their interests have been resolved partly in the form of USINOR shares.

Though USINOR was itself formed by two companies—Forges et Aciéries du Nord et de l'Est and S.A. Denain-Anzin—on a 50-50 basis, some 7 per cent. of the share capital became available to minority shareholders as the result of a capital increase. USINOR will now be able to produce at Dunkirk medium and thick rolled goods instead of having to erect a similar mill elsewhere. Initial raw steel capacity at Dunkirk is now to be doubled to 1,000,000 metric tons.

WHAT WILL BE the biggest tube plant in Siberia is to be erected at Novo-Sibirsk. It is expected the initial operation will begin before the end of this year. Until now Siberia has had to draw the tubes she needs from other parts of the Soviet Union.

Export Embargo List Revised

UP-TO-DATE and comprehensive list of goods subject to strategic embargo has been published in the Board of Trade Journal. The new list makes a number of routine changes not hitherto announced. Four items have been deleted—milling machines for aircraft spars, germanium, cobalt compounds, and petroleum-based hydraulic fluids.

Relaxations have been introduced in several items, including steelworks' plant, certain electronic equipment, and transistors. At the same time the embargo now includes some narrow ranges of specialized strategic equipment not hitherto covered.

New items and items in which effective changes have been made since the last publication include:—

Metalworking machinery: Grinding heads and spindle assemblies; forging hammers, presses, and specialized controls, accessories, and parts. Chemical and petroleum equipment: Ion vacuum pumps; valves, cocks, and pressure regulators; pipe and tubing made of, lined with, or covered with polytetrafluoroethylene or polytrifluorochloroethylene; containers, jacketed only, for the storage or transportation of liquefied gases, including mobile units.

Electrical and power-generating equipment: Electric vacuum furnaces. General industrial equipment: Metal rolling mills including sheet and strip mills as specified; mills specially designed or re-designed for rolling metals and alloys with a melting point exceeding 1,900 deg. C.; specialized controls, accessories, and parts for such mills; equipment for the manufacture of semiconductor materials.

Transportation equipment: Gyro compasses and gyroscopic equipment. Electronic equipment. Communication, navigation, direction finding, and radar equipment. Metals, minerals, and their manufactures: Anti-friction bearings (ball, roller) and parts; magnetic metals; alloy steels; molybdenum; nickel. Chemicals, metalloids, and petroleum products: Stabilizers for explosives; hydrazine in concentrations of 70 per cent. or more.

The official list should be consulted for full classification, specification, and description of amendments and changes and general inquiries about the embargo should be addressed to the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, London, S.W.1.

Oil Consumption and Reserves: Mr. H. E. Collins' Comments

MR. H. E. COLLINS, National Coal Board member for production and reconstruction, a summary of whose article in the Golden Jubilee number of the journal of the Association of Mining Electrical and Mechanical Engineers appeared in our last issue, has asked us to explain that his comments on oil consumption and reserves were given with certain qualifications in the original text. To avoid misunderstanding we produce the full version of his remarks on this subject:

"Despite feverish prospecting for oil over the past few years the potential reserves are still considered to be insufficient to support the current consumption for more than a century or so. If the present rate of increase in oil consumption were to continue the exhaustion of oil reserves might well be in sight well before the year 2000."

MI's Acquisition of Lancashire Dynamo

CHANGES in the composition of the board of Lancashire Dynamo Holdings, Limited, following its acquisition by Metal Industries, Limited, are announced. Sir Charles Westlake, chairman, and Mr. John Black, deputy chairman, of Metal Industries, have been appointed chairman and deputy chairman, respectively, of Lancashire Dynamo Holdings.

SIR CHARLES WESTLAKE

Lt.-Col. G. S. Marston has resigned as chairman and managing director of the latter company, but the Earl of Halsbury retains his office as vice-chairman.

Last Friday the Lancashire Dynamo directors announced that they had reconsidered their position and recommended those stockholders who had not already done so to accept the MI offer before the extended closing date, the following Tuesday. Col. Marston stated that he and his co-directors had decided to accept the offer for their personal holdings and he added that it was for each stockholder to decide which of the alternatives met his needs.

Metal Industries announced yesterday (Thursday) that acceptances had been received in respect of over 90 per cent. of that part of the ordinary stock in Lancashire Dynamo Holdings to which its offer applied, and also for over 90 per cent. of the preference stock. After February 19 (the closing date of the offer) the opportunity of the Lancashire Dynamo ordinary shareholders electing to take alternative "B"—one half of one ordinary share in MI and 45s. in cash—will lapse and ordinary stock units will thereafter be acquired only on the basis of one new MI ordinary and 12s. in cash.

Priest Furnaces Books Two Big Orders

TWO big contracts, worth about £2,000,000, for the supply of steelworks' equipment have been awarded to Priest Furnaces, Limited, Middlesbrough. One of them—the biggest ever handled by the company—is for the new Spencer Works in South Wales of Richard Thomas & Baldwins, Limited, and includes the supply of a battery of 20 blast-furnace gas-fired soaking pits, to be used for re-heating ingots before delivery to the slabbing mills.

The second contract, for the new Ravenscraig plant in Scotland of Colvilles, Limited, includes the supply of two oil- and gas-fired slab re-heating furnaces, a 250-ton oil-fired open-hearth furnace, and a complete gas-fired lime-burning plant. Both contracts are due for completion in September next year.

Since the Middlesbrough firm does not manufacture equipment used for its designs, it is expected that north-east firms will make the constructional steel, machinery, and castings required.

New RTB Steel Mill

WILL BE MOST UP-TO-DATE IN THE WORLD

CONTRACTS have been awarded for practically all the main installations at the Spencer Works—the integrated steel mill which is to be built by Richard Thomas & Baldwins, Limited, on a site alongside the main London to South Wales railway line at Llanwern, Newport (Mon). The steelworks in the initial stages is planned to produce 1,400,000 tons of steel ingots a year nearly all of which will be rolled into light plates and cold-reduced sheets. A small tonnage of slabs will be sent to the company's Ebbw Vale works for processing into sheets and tinplate.

In his first report as chairman of the company, Mr. G. C. R. Eley, points out that the works is being built on a "green field" site which will permit of great subsequent expansion. The first stage itself can readily be expanded to produce at least 3,000,000 ingot tons per annum and the plant and its layout will make it among the most up-to-date integrated strip mills in the world.

MR. G. C. R. ELEY

Some idea of the extent and scope of the Spencer Works is given in the following details of the plant which have been issued by the company. The plant, the first stage of which will begin to come into production towards the end of 1961, will give employment to between 5,000 and 6,000.

L.D. Steelmaking Process

Initially about 20,000 tons of coking coal will be required each week for the two batteries of coke ovens, comprising in all 140 ovens. The weekly output will be 14,000 tons of coke and 200,000,000 cub. ft. of gas. After extraction of the by-products the gas will be used as fuel in other departments of the works.

All iron ores for the blast furnaces will be dealt with at the ore preparation plant which will include a 2-strand sinter plant in which the iron ores will be specially treated before charging into the blast furnace. The blast-furnace installation will comprise two, each of about 30 ft. hearth diameter, six hot blast stoves, and appropriate blowing equipment and gas-cleaning plant.

As previously announced, RTB has signed a licensing agreement with Brassert Oxygen Technik, AG, of Zurich, for the operation of the L.D. steelmaking process which is to be used at Llanwern. The installation will comprise three 100-ton vessels, together with blowing equipment. Two 200-ton tonnage-oxygen plants will serve this department. Hot metal from the blast furnaces will be stored in two mixers each of 1,200 tons capacity. To reheat the ingots before rolling in a universal slabbing mill 22 soaking pits will be installed.

The 68-in. continuous hot strip mill will be equipped with two large slab reheating furnaces, the usual scale breakers and roughing mills, a 6-stand tandem finishing train, and two down coilers. Part of the output will be processed in the hot-sheet finishing department, but the bulk will be sent forward for cold reduction.

A continuous pickling line, complete with acid recovery plant, a 4-stand cold reduction mill, and two temper mills will be the main components in this department. Other equipment will include annealing furnaces larger than any in the country, cut-up lines, and oiling and inspection units. In all, the Spencer Works will produce 1,085,000 tons of hot-rolled coil, of which 805,000 tons will be cold reduced, giving an output per year of 710,000 tons of cold-rolled sheets. Coal, limestone, and dolomite will come from mines and quarries in the area and it is proposed that, by arrangement with the local authorities, the bulk of the extensive volume of water needed will be drawn from the river Usk and from springs at the Severn Tunnel.

The greater part of the iron ore required will be imported through Newport Docks, but supplies of home ore will be obtained from the Oxfordshire area. The company also states that additional supplies of the high-quality blast-furnace coke required will come from carbonizing plants in the South Wales area.

Dealing with the general progress of the company, Mr. Eley pays particular tribute to management, staff and workpeople for making it possible to achieve an increase in profits of over 25 per cent. in a year of "considerable physical difficulties." Manufacturing and trading profit increased by £2,150,552 and during the year £9,250,000, almost wholly out of resources, was spent on capital works.

In addition to the Spencer Works, the company was experimenting in the forefront of modern practice. It was considering the installation at the Panteg Works of a large-scale experimental plant to pursue the continuous casting of wide slabs in low-carbon steel for sheets and tinplate and the production of stainless steel slabs. By the time RTB was ready for further development of the Newport site, it was hoped that continuous casting would have been sufficiently developed to enable it to play an integral part in the steelmaking process there.

During the last five years the company has spent over £33,000,000 on modernization and new development and yet, throughout that period and until quite lately, had been a lender not a borrower of money. Even future borrowings, which would be necessary in view of the programme before it, would be relatively temporary in character. The £70,000,000 maximum loan from the Ministry of Power for the Newport project was due for repayment by 1971 and RTB expected to be able without difficulty to repay that loan from the company's own resources, to pay a proper

return on its capital and, in addition, to carry out further expansion and improvement projects.

The theme of expansion was also pre-eminent in a speech made by Mr. H. F. Spencer, managing director of Richard Thomas & Baldwins, at the RTB staff college at Stoke d'Abernon, and reproduced in the company's paper Ingot News. The first stage represents only about a fifth of what the new works could develop into, he states, and 6,000,000 tons or more a year was a future possible output figure.

Referring to the £23,000,000 development scheme at the company's Redbourn (Scunthorpe) steelworks, Mr. Spencer believes that considerable diversification will follow. "The Redbourn scheme is clearly an unfinished idea," he says. "It will be rational to finish at least some of the steel in one form or another." Such a development would be in line with present thinking in Scunthorpe, which felt that the steelworks of the town were too much attached to heavy industry and needed consumer goods outlets.

Steel Board's Public Relations

MR. SAMUEL CLEMENT LESLIE, former head of the information division of the Treasury, has been appointed consultant on public relations by the Iron and Steel Board. His Press officer is to be Mr. J. F. Aylard, a member of the board's staff.

Mr. Leslie was born at Perth, Western Australia, in 1898 and educated at Melbourne Church of England Grammar School. Afterwards, he went to Melbourne University and Balliol College, Oxford, where he was a Rhodes Scholar. In 1922-23, he was Lecturer in Philosophy at the University College of North Wales and the following year senior Lecturer in Philosophy at Melbourne University.

In 1926, Mr. Leslie accompanied Mr. S. M. Bruce, then Australian Prime Minister, to the Imperial Conference. He remained in Britain and went into business, first as publicity manager to the Gas Light & Coke Company from 1936 until 1940, when he became director of public relations to the Ministry of Supply. He held a similar appointment with the Home Office and Ministry of Home Security from 1940 until 1945. For the next two years he was director of the Council of Industrial Design. In 1946, Mr. Leslie was appointed CBE.

Mr. Leslie relinquished his Treasury appointment last year on becoming part-time consultant on information policy, both internal and external, to Associated Electrical Industries, Limited.

DUMBARTON SHIPBUILDER CENTENARY

THE centenary has just been celebrated at Dumbarton of the birth, on February 7, 1860, of Archibald Denny, a prominent member of a well-known shipbuilding family. When he began his career, shipbuilding was already an established tradition in his family.

His special interest in design and the attainment of higher service speeds on an economic basis contributed greatly to the building of fast cross-Channel ships, for which the Denny name is internationally known.

He was created a baronet in 1913 and died on May 29, 1936.

Technical Staff College Appeal

A STAFF college for senior technical teachers and senior industrial staff should be established in Britain by the end of next year. At a Press conference on Thursday of last week, Sir Alexander Fleck, chairman of Imperial Chemical Industries, Limited, appealed to industry for the £40,000 still needed for its establishment. He said he had written to 250 industrial and commercial firms asking for contributions—£100,000 was required—and that £60,000 had already been promised by 30 firms.

Object of the college is to provide a centre where the senior staff from all types of colleges giving technical and commercial education, and senior members of industrial and commercial firms can exchange ideas and experience. In this way, the college will benefit industry and commerce by providing a closer link between them and technical education, and by providing better technical education.

Short courses of two to four weeks throughout the year are planned for groups of not more than 30, two thirds of whom will be technical teachers.

Its establishment was recommended by the Jackson Committee on the supply and training of teachers for technical colleges. The committee felt there was a need at the highest level of the technical teaching profession for men with the breadth of outlook, attitude of mind, and authority needed to exert a strong influence both inside their own colleges and on the industrial and commercial firms they serve. The appeal for funds is supported by the Minister of Education, Sir David Eccles, who has nominated Sir Alexander as chairman of the governing body, which will represent industry and commerce, local education authorities, and teachers.

Running costs of the college of £30,000 a year will be paid mainly from public funds. A site has not yet been decided.

Arthur Lee's Bid for John Shaw

FURTHER details of the bid by Arthur Lee & Sons, Limited, manufacturers of wire and bright-drawn strip, etc., of Sheffield, for John Shaw, Limited, wire rope manufacturers, of Worksop, are given in the notice calling an extra-ordinary meeting of Arthur Lee for February 22 to approve its capital increase.

If the offer becomes unconditional, Mr. G. W. Lee and Mr. A. M. Lee will be appointed to the board of John Shaw and Mr. J. M. Shaw, chairman and managing director of John Shaw, will join the Arthur Lee board.

The offer is 26 Lee 2s. 6d. shares (equivalent to 13 shares prior to the proposed 100 per cent. scrip issue), plus £2 9s. cash, per £1 Shaw ordinary (£33,000 in issue). Group net profit, before tax, of John Shaw for the year to June 30, 1959, was £35,878, against £46,622, and net assets at that date amounted to £393,424.

It is proposed to increase the authorized capital of Arthur Lee from £1,650,000 to £4,000,000 to satisfy the £1,500,000 capitalization and the issue of 858,000 shares against the acquisition of John Shaw. There is no intention of issuing any further shares at present, it is stated.

ROADWAY SUPPORTS IN MINES

Trials in the East Midlands

By A. D. McLUCKIE, B.Sc. Eng. (Min.), M.Sc., A.M.I.Min.E.

With the present emphasis upon economies in the mines, comes the need to re-examine the systems of roadway support in current use with a view to improving cost figures. In this paper, presented to the South Midland Branch of the National Association of Colliery Managers on October 5, 1959, the author reviews several types of support which have been introduced in the East Midlands Division of the National Coal Board, and stresses the value of arches having yielding characteristics.

ROADWAY supports and their development have been rather overshadowed in recent years by the drive for mechanization. Much effort and consideration has been given to the development of supports to facilitate power loading, but it is intended in this paper to review roadway supports and systems which are at present available and under development.

Before doing so it would perhaps be better to consider the main requirements which our roadways are expected to fulfil. They are in the main fundamental, but of such importance to the efficient working of the mines, that they are worth considering. The main functions of roadways are to provide access to and from the coal face and for ventilation and transport. With ever increasing rates of extraction, gas yields in consequence are increasing, making the need for efficient ventilation all the more important.

Much consideration is given to the equipment for the transport of coal, but is it appreciated how adverse roadway conditions can severely affect output? Transport of materials inbye can involve considerable labour if the roadways and supports are crushed, distorted and undersize, preventing the haulage facilities from functioning properly.

Consumption and Costs

The extent and magnitude of the roadway supports problem may be appreciated if the consumption and cost of these supports is considered.

Throughout the East Midlands Division of the National Coal Board there are some 2,000 miles of roadways, the majority of which are formed at the seam horizon to serve longwall faces, while others are tunnels or cross-measure drifts. The latter two, however, represent only a small percentage of the total length of roadways underground. Of the total length of roadways some 71 per cent. are supported by rigid steel arches, 19 per cent. by cambered girders or straight rolled steel joists set on wooden supports, 6 per cent. by props and bars entirely of wood, and 2 per cent. remain unsupported.

Annual use of rigid arches in the division amounts to approximately 80.000 tons of steel, that of Area 7, East Midlands Division, being in the region of 12,000 tons. This represents a cost of 2s. 1.6d. and 1s. 11½d./ton, respectively. Also, the annual tonnage of steel for new arches used in Area 7, for longwall roadways represents approximately 80,000 arches. When considering the yardage of longwall roadways driven, the consumption of arches should be in the region of 60,000 if none were destroyed. This means that a number in excess of 20,000 arches per year are destroyed, considering the number of arches which are re-used after being withdrawn from old roadways.

In effect 25 per cent. of the arches are destroyed, this represents a cost of £182,000 for materials and approximately £100,000 for labour, or approximately 9d. per ton. Quite an appreciable saving could, therefore, be made if a greater utilization of the arches could be achieved.

Quality of Materials

The mining industry has undoubtedly paid dearly, and is still paying dearly for using materials which are weak and undersize, because they have been the only materials readily available. Much development work and thought could no doubt be usefully employed in producing supports of the correct quality and design to suit mining conditions.

Little regard has been paid in this country to the quality of steel which has been available for use for roof support equipment, particularly for roadway supports. Frequently, arches which are the most commonly used support are made from re-rolled H-section material whose quality is to a great extent indeterminate and inconsistent. Even rollings from prime steel leave much to be desired in strength and toughness. The bulk of supplies have been of a standard and quality suitable for constructional surface work, and not mining conditions.

In fact, supports of suitable quality have been imported from the Continent to deal with many of the more severe conditions encountered; apart from

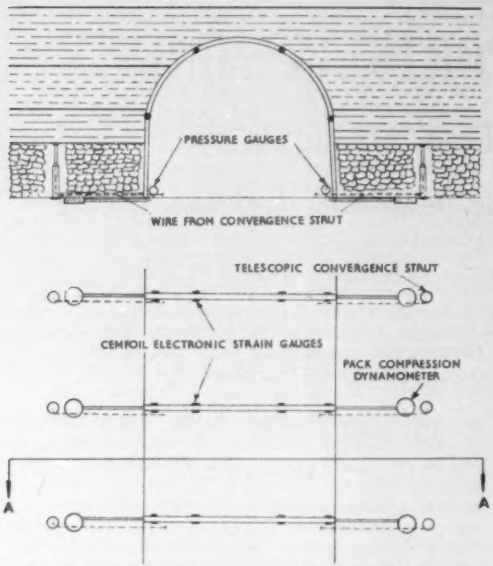

FIG. 1.—DISPOSITION OF PACK DYNAMOMETERS AND STRAIN GAUGES.

their design features, they have better metallurgical properties.

Support Characteristics

It is remarkable that, after mining so many years, very little is known about the fundamental loads, their nature, extent and application to the roadway supports. This has been due mainly to the lack of instruments and equipment available for the purpose of measuring these phenomena. This is probably the reason why at many collieries certain sizes of arches are set religiously at certain centres, which were determined many years previously, to deal with conditions which have altered considerably to those appertaining today. Such customs having been established tend to be perpetuated irrespective of conditions.

Many theories have been advanced about the amount of resistance which a roadway support should be capable of giving, and in an attempt to ascertain the degree of loading and the stresses to which the supports are subjected, tests are currently being carried out in the East Midlands Division.

Pack dynamometers have been placed in the gateside packs, and arches have been fitted with strain gauges, devised and designed by the Mining Research Establishment at Isleworth. It is hoped in this way to ascertain the relative rates of loading of both the packs and the supports and also to determine relative convergence and rates of closure of the packs and arches. The disposition of these instruments is indicated in Fig. 1. It is felt that the rate of loading of the supports should lag behind that of the packs, otherwise distortion of the supports will take place, as they will be taking more than their share of the load.

These features are indicated in graphical form in Fig. 2. The major resistance, and consequently the major loads, of any roadway support system are carried by the gateside packs. The load rate of the gateside packs is indicated by curves (A). Obviously the better the quality of the gateside packs the more readily they will accept load. Characteristic curves such as A1 being achieved rather than A2. If the characteristics of the supports are illustrated by curves B in Fig. 2, the non-yielding or rigid support will be represented by curve B1, while the yielding support will be represented by curve B2. By superimposing the two sets of curves the relationship which exists between the characteristics of both support and pack is evident.

It is obvious from the curves that: (1) The pack should have as steeply a rising characteristic as possible, the hatched area below the pack curve representing the "safe" area for the supports. The greater this safe area, the more latitude is allowed in the selection of supports; and (2) the more steeply rising the characteristic of the support, obviously the more rapidly will the support attain its buckling load, or the nearer to the face will be the first back rip.

It is hoped to gain a greater appreciation of the factors involving roadway supports, by the tests at present being carried out.

Support Yield

During the past few years it has become accepted that face supports in particular, should have both a uniform setting load and yield load, and that provision should be made for controlled yield and closure of the supports without destroying the support.

Consider the relatively short period of time which the face supports are set, compared with the roadway supports, and the comparatively small amount of closure which takes place on the face. Has sufficient consideration been given to the provision of these qualities in roadway supports which are set for much longer periods and inevitably suffer greater amounts of closure? Not only is provision neces-

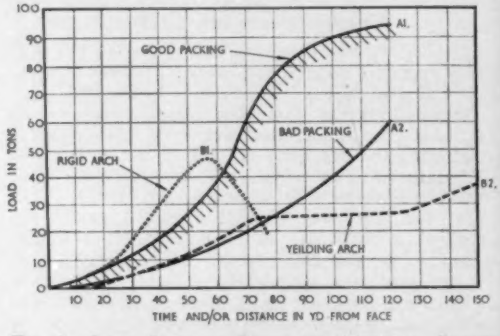

FIG. 2.—LOAD RATE OF RIGID AND YIELDING ARCHES AND ROADSIDE PACKS.

sary for vertical closure, but lateral closure also takes place due to side pressures.

An investigation recently carried out on an installation of Usspurwies arches emphasized the need for some provision to be made for yield in the arch. Fig. 3 shows the rates of closure of the roadway. The reduction in total roadway height amounted to 3 ft. 8 in., and the reduction in width across the top of the boxes was 2 ft. 1 in. Yield of the arch into the box was in the region of 1 ft. 4 in., while the yield boxes penetrated the floor 11 in. on the left-hand side of the road and 2 ft. 3 in. on the right-hand side of the road.

From these figures it will be observed that considerable closure of the roadway took place, and while rigid arches in these circumstances had badly distorted necessitating much repair work, the Usspurwies arches delayed the need for immediate repair work.

Support Withdrawal

Increasing mechanization, and concentration of output has resulted in rapid face advances, in some cases up to 13 and 14 ft./day. Where systematic back ripping is necessary in the roadways of such faces, the difficulties of maintaining good roadway conditions are apparent. The usual standard of performance in back rippings is such that three or perhaps four teams of back rippers are necessary in each roadway in order to keep up to date with roadway maintenance. The difficulties of maintaining such a labour force, which very often has to be seconded to coal producing activities, as well as the cost involved, can be very onerous.

It is obvious in such circumstances a desirable feature of the roadway support is that it should be readily and easily withdrawn. The Heathcote quick-release arch coupler and quick-release stilt are devices which have been devised in the East Midlands Division, in No. 3 Area, to fulfil such a function, and are referred to later.

Strata Reinforcement

One aspect of roadway support which should not be overlooked is that of roof bolting. The utilization of roof bolts as sole means of support has been described in several technical papers in recent years, but due consideration should be given to the use of roof bolts as an ancillary or reinforcement to existing roadway supports.

In many cases, much difficulty is experienced in controlling strata both at roadheads and in the gate roads where roof conditions are weak. The large expanses of roof exposed to accommodate the machinery which has to be situated at, and moved under, the roadheads of mechanized faces, often leads to adverse roof conditions due to excessive roof movement being allowed to take place. The roof in the pack-hole areas may be badly broken, creating difficulties in building effective packs, which are important.

In several instances roof bolts have been used to overcome these difficulties. The bolts are systematically set across the roadhead and in the pack holes as shown in Fig. 4. Immediately, improvements in roof conditions have resulted over the roadhead and pack holes, by creating a beam of strata which is capable of supporting itself by bridging across the gate-side packs. It has been observed that this action has also resulted in an improvement in the roadway conditions. The arches have been relieved of much of the "dead" weight which they previously had to carry, and consequently arch distortion and repair work has been reduced. The arches can be spaced at greater intervals to compensate for the additional cost of labour and materials involved in the bolting operations. Appreciable reductions in gas yields have also been noted because of reduced bed separation.

Recently bolts were introduced in such a way at a colliery in the division where excessive gas yields were being experienced. The roof strata contained a good deal of carbonaceous material which was easily broken. As many as six back rips have been employed in one roadway to maintain roadway conditions. The large number of back rips, together with the breakage of roof strata, were no doubt the chief means for the excessive build-up of gas in the roadways. Unfortunateiy, at the time of writing the face had not advanced sufficiently for the results to be conclusive, but there was every indication that roadway conditions had improved.

There are no doubt many instances in the

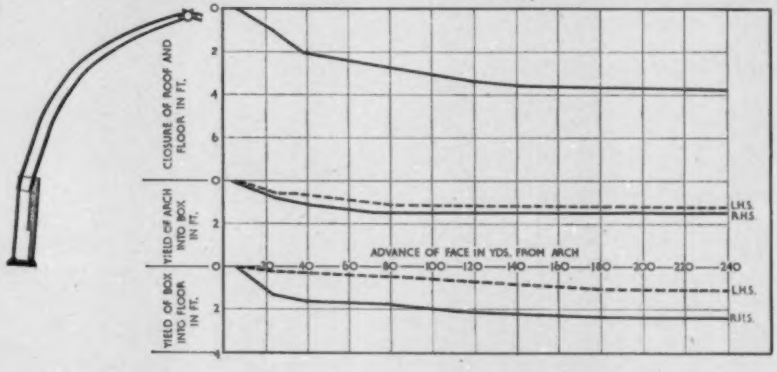

FIG. 3.—RATES OF CLOSURE OF A ROADWAY SUPPORTED WITH USSPURWIES YIELDING ARCHES.

division where similar action could be taken, if only to reduce the costs of roadway maintenance where they are high.

Use of Stilts on Arches

Stress has been made of the need to provide yield in arches. For many years experiments have been made with various types of simple yield devices such as stilts to accommodate yield. Usually these have taken the form of steel or wooden legs attached to the arch by clamps and designed to slide up the web of the arch when load is applied to the arch. Further, wooden sole pieces and wire-mesh bags filled with small stone debris have been used in an attempt to accomplish some form of yield.

The performance of most of these methods leaves much to be desired, and further types are still becoming available for use. One such recent innovation is the "Pierre Lock" stilt which comprises a prefabricated channel leg complete with two U-bolts. The leg stands approximately 3 ft. 6 in. high and allows for yield up to 2 ft. 6 in.

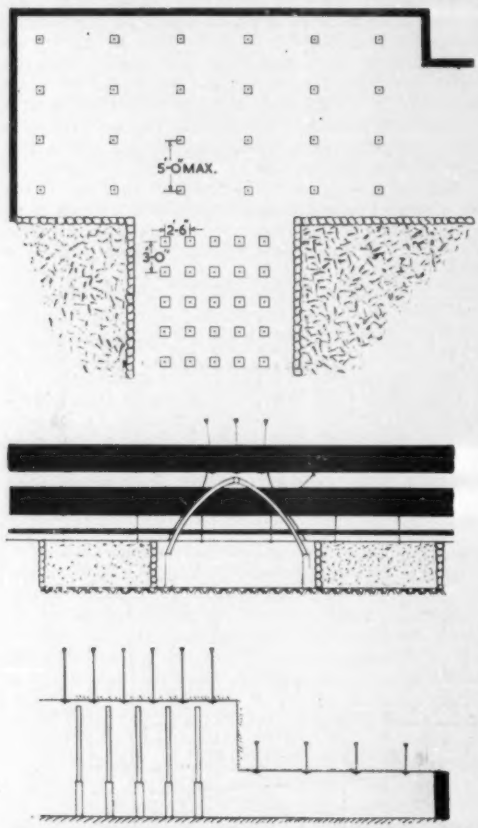

FIG. 4.—SUGGESTED ROOF-BOLTING PATTERN FOR REINFORCING STRATA AT ROADHEADS.

To attach the stilt to the arch leg, the foot of the leg is allowed to enter into the stilt for a distance of about 12 in., thereafter the U-bolt clamps are tightened with the aid of torque spanners. The use of torque spanners might be considered a disadvantage, but it is essential not to overtighten the bolts, and to tighten them to a predetermined point in order to give a uniform yield.

The difficulty with many of these sliding type stilts is the variation in yield loads which can arise through the sliding members becoming locked upon each other because of lateral and transverse movements. The yield loads in such circumstances may become greater than the buckling load of the arch, resulting in the arch functioning as a rigid arch.

Yielding Arches

During the years since nationalization trials with four types of yielding arch have been conducted in the East Midlands Division. They are: (*a*) Usspurwies; (*b*) Toussaint-Heintzmann or T-H arch; (*c*) Glocken-Profil; and (*d*) Kuntzler.

The most popular and commonly used within the division has been the T-H arch, while the Usspurwies, the most recent type to be introduced, is gaining in popularity at a number of collieries. The Usspurwies arch, although more expensive than rigid arches, has the advantage that it is capable of yielding vertically for a maximum closure of 38 in., and is capable of accommodating lateral closure.

It is manufactured in a variety of sizes and weights to suit the conditions and size of gate required. The arch is made up of two arch members hinged at the crown by means of a large bolt. The two halves of the arch bear upon each other at the crown, in such a way that no shear load is borne by the bolt. The feet of the arch are slightly rounded, and fit into yield or friction boxes.

The yield boxes are steel tubes, rectangular in section, 40 in. to 50 in. long, and open at both ends. This carries the leg of the arch between a long wooden wedge and a guide shoe fitted at the upper end of the box. The function of the wedge is to promote resistance to the penetration of the arch leg into the box by a combination of friction and compression of the wedge. The resistance offered builds up rapidly to approximately 25 tons and thereafter remains stationary at about that value throughout the whole of the yield.

The experience gained to date with this type of arch in the division indicates that some benefits can be obtained in reducing roadway repair costs, particularly where extremely heavy roof conditions are encountered. In these conditions and when floor lift is excessive, considerable difficulties and expenditure can be incurred in the withdrawal of the arches, in which case the benefits previously obtained in reduced roadway maintenance cost may well be nullified.

Types (*b*), (*c*) and (*d*) above have been described in detail in the Information Bulletin 59/204 "Trials with Sliding Arches." Installations of the

different types of arches were tried in similar conditions for purposes of comparison.

The following is an extract from the general conclusions reached after the trials:

"It is apparent from the results that none of the three types of sliding arches was as good as expected. The Kuntzler arch clearly was more easily distorted than either of the two types, and resistance to distortion was greatest in the Toussaint-Heintzmann arch. There is strong evidence that in conditions of the kind prevailing at all three installations, adequately tied rigid arches on wooden stilts behave as well as sliding arches. Many inherent defects are apparent in the design of all three types of sliding arch.

"Although the general adoption of sliding arches for gate roads cannot be recommended, the use of these arches where they have in the past been found effective cannot be condemned.

"There are circumstances in which they might be effective and in such instances their use should not be discouraged. For example, they may be usefully employed in conditions where excessive deformation of fish-plated arches takes place due to a degree of side pressure which prevents the satisfactory operation of the normal stilts."

It will be seen from the comments on the Usspurwies arch and the general conclusions of the Information Bulletin that the complete answer to controlled yield in roadways has not yet been achieved. Placing a support between the floor and roof, whether the support be rigid or yielding, may under the circumstances of the stresses involved be incorrect.

Perhaps the support should be from some point in the stratum above the top of the pack or built into the pack side, thus enabling the support to converge with the stratum in a body, the pack consolidation taking place without causing undue stress on the support. Under these circumstances, the support would be a token cover for loose material above the roadway area, the main support being provided by the gate-side packs. The need to match the characteristics of the roadway supports with the pack support would then no longer be so essential.

Quick-release Mechanisms

The Heathcote quick-release coupler incorporates a connector which is the joint design of Mr. G. G. Heathcote, Area 3, East Midlands Division, and Mr. J. R. Ashley, Nottingham University. The purpose of the quick-release connector, illustrated in Fig. 5, is mainly to improve the rate of advance of repair sets on roadway enlargement and in particular, arch replacement in supporting gates of rapidly advancing machine faces.

The connection replaces the conventional arch fish plates and bolts and rigidly holds the ends of the arch sections at the crown similar to plates but at a distance of 12 in. apart. The connector is in the form of a curved rectangular box made from $\frac{5}{16}$ in. thick mild-steel plate and pressed into channels. The overall length is 29½ in. and the sides are pressed out to receive the bottom carrying channel. A rigid positive grip is exerted on the ends of the arch sections by means of two flat wedges which are inserted between girdles formed by the $\frac{5}{16}$-in. steel plate.

The wedges are slotted and fit on to a stop, welded into the girdle to prevent complete detachment from the body of the device. On the bottom channel a strip of plate 4½ in. by 2 in. by ¼ in. is welded 9 in. from the ends of the channel. This strip forms a rigid stop against which the ends of the arch sections are secured by the wedges. It will be seen from Fig. 5 that the wedges hold the box and stops firmly to the arch ends, the stops thus ensuring no slip under any circumstances.

With arches up to 12 ft. wide, the complete arch, with the device temporarily in the closed position, may be lifted up and the sections pushed out to the stops when vertical, the box then being secured in its correct position by the wedges. The device is designed to allow a limited degree of

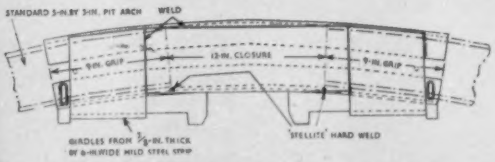

FIG. 5.—SIDE VIEW OF THE HEATHCOTE QUICK-RELEASE COUPLER, SHOWING WEDGES IN RELEASE POSITION.

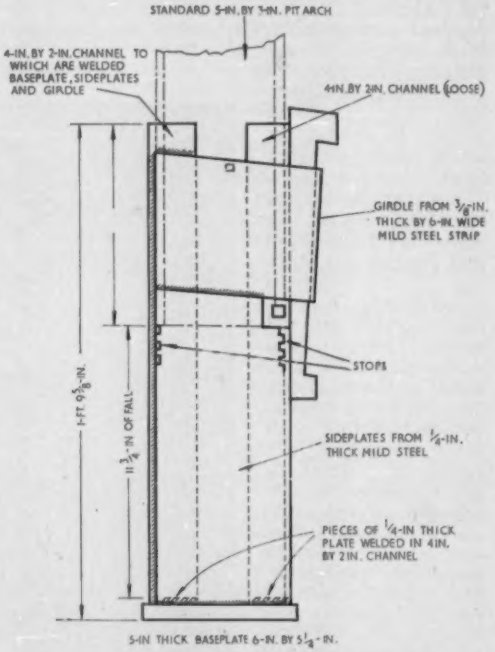
STANDARD 5-IN. BY 3-IN. PIT ARCH
4-IN. BY 2-IN. CHANNEL TO WHICH ARE WELDED BASEPLATE, SIDEPLATES AND GIRDLE
4-IN. BY 2-IN. CHANNEL (LOOSE)
GIRDLE FROM ⅜-IN. THICK BY 6-IN. WIDE MILD STEEL STRIP
STOPS
1-FT. 9⅝-IN.
11¾-IN. OF FALL
SIDEPLATES FROM ¼-IN. THICK MILD STEEL
PIECES OF ¼-IN. THICK PLATE WELDED IN 4-IN. BY 2-IN. CHANNEL
5-IN. THICK BASEPLATE 6-IN. BY 5⅛-IN.

FIG. 6.—HEATHCOTE QUICK-RELEASE STILT.

closure before the arch comes in contact with the stops.

The main advantage lies in the quick-release action. When it is desired to renew the section of roadway, the release is operated on the arch requiring replacement, allowing the two ends of the arch sections to come together while, at the same time, continuing to hold the arch securely until ready for dismantling. It is estimated that the time saved, if these connectors are used correctly, would be approximately 1½ hr. per arch set, and that cover could still be maintained while the arches are released and the stratum is dressed behind the arches.

The quick-release stilt is illustrated in Fig. 6. In this case the single broad wedge holds the foot of the arch 11¼ in. from the base plate against a strong stop. The base plate being made from ⅜-in. mild steel. When loader-gate repairs are required at present where conveyors are running two shifts with coal from continuous mining systems, a repair yardage on the one shift is considerably behind the rate of face advancement, unless several teams of men are employed.

The operations of cutting out old cover boards, and freeing arches to permit firing have always been expensive in men's time, and have resulted in: (*a*) Arches being too badly damaged to permit reuse, necessitating additional handling and transport of new and scrap arches. (The manpower is unable to keep up with the roadway settlement); (*b*) additional sets of men put in to increase the repaired yardage rate has resulted in a reduction in the advance per manshift generally due to the difficulty of supplying the inbye sets and removing old material efficiently; and (*c*) shotfiring limited to short holes drilled from the new work.

By the use of the "retracting wedge box stilt" it is envisaged that clearing and drilling arch lengths systematically, depending on conditions, will permit two to three arch settings to be completed in the time now being taken to set one. On no existing arch girder systems can fishplates, or clamps, be safely released to ease pressure off the arch, and at the same time remain firm to withstand any emergency. The "box" construction of the wedge side is designed to hold the arch safely and withstand twisting.

The wedge box may be set to allow convergence under pressure before the arch leg comes up to the box stops. In this way early damage to the arch may be prevented. When the arch is set on to the box stops and tightened into place by the wedges, the device may be used in the same way as a quick-release connection. By knocking off the wedges the arch is dropped 11 in. in the box allowing the speedy removal of boards ready for subsequent firing over two or more settings. The boxes are then cleared as the old arches are dismantled and sent up to the front lip for re-setting.

In this way, yardage at back ripping units can be kept in step with face advance, and enable arches to be re-set after the first weight, *i.e.*, 70 to 100 yd. behind the face, allowing a considerable extension in the life of arch supports. Back ripping advances of 3 yd./shift in place of the average yard per shift may be expected.

Timber Arches

An interesting departure from the use of steel has been in the use of laminated timber. A limited trial of some 110 arches is currently in progress in Area 7, East Midlands Division. The arches are composed of fine laminations or layers of wood having resin compounds as adhesives, the whole being highly compressed and moulded to form a rigid beam. The form of the beam in this case follows that of a rigid rolled steel joist arch, although the cross section is slightly larger than that of a rolled steel joist for comparable strength. This type of arch no doubt has the advantages of reduced weight for ease of handling, as well as a slightly reduced cost compared to the simple fishplated arch.

Although a number have been tried unstilted in

FIG. 7.—LAMINATED TIMBER ARCHES IN NO. 7 AREA, EAST MIDLANDS DIVISION, NCB.

a gate road of a longwall face in the Little Kilburn seam, to ascertain the effect of strata movement on their performance, it is doubtful if their use could be extended generally to roadways subjected to any great amount of movement. Their use would primarily be for roadways situated in settled ground. By virtue of their laminated construction, they are practically non-inflammable. Fig. 7 shows an installation of laminated timber arches in Area 7, East Midlands Division.

Continuous Supports

The method of application and the disposition of supports along roadways is being given some consideration and the question of whether or not points of high resistance as given by rigid arches is correct, or whether more uniform resistance should be provided throughout the length of the roadway. By providing uniform resistance the supports and the lagging would in effect be combined, possibly giving more efficient support. In this way, the weakness of arch systems in that struts are rarely used would be obviated. One design which is under consideration is illustrated in Fig. 8. The question of cost is, of course, an important factor, as well as handleability in the design of these systems, but these matters are being given consideration.

Floor Bolting and Double Packing

So far, mention has been made only of supporting roof strata, but in many instances difficulties are encountered with floor lift or heave. The most recent innovation to counter this floor movement has been in the application of bolts, but the experience so far gained with this system has not been too successful. It has been found that the rate of lift can be reduced, but eventually floor lift continues to take place. The difficulty, of course, is in obtaining a suitable anchorage, for usually when floor bolting is considered, the floor strata are extremely weak as opposed to roof bolting which, when considered, is associated with good strata. However, the technique of grouting the bolts in, is being further developed to improve the anchorage capacity of the floor strata.

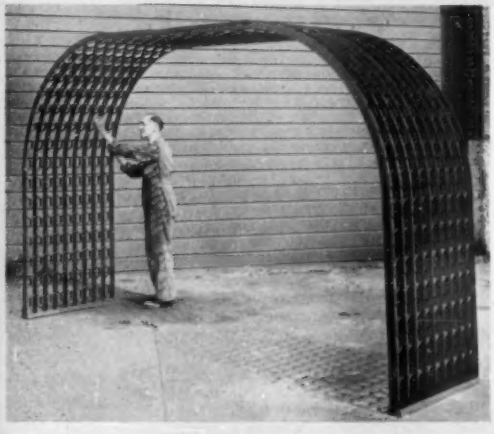

FIG. 8.—RECENTLY DESIGNED ARCH TO OFFER UNIFORM RESISTANCE.

The other possibility of countering floor lift in the main gates of longwall faces is rather an older method which in the past has often proved successful, and that is in double packing the gate roads. Although this method may involve a high initial cost, generally the benefits gained in reducing the repair work involved in the roadway are well worth while.

With the present state of the industry requiring strict economies, it behoves re-examination of the question of roadway supports in general and to see if any alterations to the present systems can be effected which will improve cost figures.

Views expressed in this paper are those of the author and not necessarily of the National Coal Board.

DISCUSSION

Mr. L. J. MILLS asked for the best length of gate-side pack for average conditions, and what the optimum length should be for varying seam thicknesses. He was also interested to learn whether the author considered that such benefits as were obtained from double packing were due rather more to the intensity of packing and the greater care which was taken in pack construction with this system, than with the provision of a small waste between the two packs into which the roof and floor could flow. Referring to timber arches, Mr. Mills asked if they had any practical value at times when normal steel arches were available.

In reply, the AUTHOR said that as regards the length of packs there was nothing specific laid down. Little was known about the most effective length of packs for various seam thicknesses and conditions. This was one aspect of roadway investigations which should be extended, together with associated roadway measurements. Often, in rather thin seams, as little as 50 per cent. of the ripping material was packed and the rest was sent out of the pit with the coal. To obtain 100 per cent. packing was another matter, as there were difficulties in packing the material, but this aspect was being dealt with by mechanized methods such as slusher packing.

With "buttress" or double packing, the additional and greater support given was generally quite satisfactory in giving effective roadway support. Where soft floors had to be contended with, this extra strong support would no doubt increase floor lift, but the provision of some area for the floor to flow into instead of into the gate road was necessary.

Timber arches were a very recent innovation. They were only in the trial stages, but from their performance to date, it would appear they were not suitable for general use in moving ground and the bulk of roadway supports would no doubt still consist of some form of steel.

Mr. A. CHAPLIN said that it was stated that many of the Continental-type supports had good metallurgical properties, and he asked if this referred to the carbon content. He also asked for the author's views on the distances between roadway supports in relation to the weights of section being used. Mr. Chaplin said that no mention was made of floor rippings, a very important method, and he asked for the author's observations on this.

In reply, the AUTHOR said that on metallurgical properties it was found that the Continental steel was tougher and more resilient than we had used, chiefly because of the carbon and manganese content together with the heat treatment processes. The type of steel imported, particularly roof bars, gave a quality which was more suitable for mining use. Up to now, particularly at roadheads, rolled-steel joists had been used and they were neither the correct design nor of the right type of steel; they appeared to distort easily.

On considering the distance apart of the supports, it was difficult to be specific. It might be beneficial to put a lighter section support at more frequent intervals, but unless provision was made for yielding, it did not matter what type of support was used, distortion was bound to take place. Fundamentally, the arch should not take the major part of the load, that should be done by the packs. The strata should bridge across the packs and whatever support was used should be in the form of a canopy which would move down with the roof itself and not be distorted. The use of rigid supports was not the correct method of support in moving ground.

If a beam to support itself was to be formed, it was wrong policy to break this beam by ripping through it; it would be better to rip out the floor. There were one or two instances in the division where this had operated satisfactorily, leaving the roof alone and taking the floor out when necessary.

Mr. R. G. JACKSON, referring to quick-release arch connectors, asked for the time taken in releasing the arches, and if they could be fitted to any size of rigid arch. He also asked if there were any new methods of recovery of arches as alternatives to Trewhellas, sylvesters, etc., particularly in the field of hydraulics.

Replying, the AUTHOR said the time saved when back ripping, if these connections were used correctly, would be approximately 1¼ hr. per arch re-set. In releasing the arch, the wedges were knocked out in a similar way to releasing a friction prop, and the two ends of the arch came together. The quick-release arch connectors could be fitted to any size of arch, but they must be suitable for the size of arch in use. The provision of hydraulic stilts and hydraulic transverse yield mechanisms was actually being considered at the moment to enable the arches to yield and to be released more quickly, but they would have to be more simple and robust than the hydraulic props in use at the moment.

Cost of Arches

Mr. S. MCKEE, referring to yielding arches, asked for figures obtained in the East Midlands Division and the method adopted to obtain these figures. He was under the impression that a laminated arch was three times more expensive than the normal rolled steel arch.

Replying, the AUTHOR said the cost of the initial prototype wooden arches was higher than steel, but depending on the quantities ordered, they would be slightly less than the cost of rolled-steel section arches.

As regards the cost of Usspurwies arches, a detailed investigation was carried out in one Area on the relative costs of these arches as against rigid steel. In the first instance the initial cost of installation was higher, but the arch distortion was less and fewer back rips were necessary. Floor lift was occurring which would greatly hinder the withdrawal of the arches and detract from their performance. The high recovery cost might well offset the lower costs of roadway maintenance and if the yielding arches had ultimately to be abandoned, the losses involved would be extremely high. Further cost investigations were proceeding.

In answer to Mr. L. R. WATKIN, who commented on the difficulties of dinting a floor which had previously been bolted, the AUTHOR said they also had experienced this difficulty. The rate of floor lift was reduced, but the ultimate floor lift was still the same.

Replying to Mr. D. SMITH, on the cost of using roof bolts to reinforce strata, the AUTHOR said the cost depended upon the extent that the existing system was going to be replaced. Where bolts alone were used, the material cost was approximately 50 per cent. of the conventional support method. The right type of labour and supervision was required to instal the bolts properly, but they could be beneficial if they produced suitable conditions to delay back ripping.

Experience in using bolts in conjunction with arches was limited, but they had found in one particular installation that the roadway conditions were greatly improved and the number of back rips would no doubt be reduced. Even if the initial cost in using bolts was slightly higher, considerable savings could no doubt result. The cost of the bolts might be in the region of 7s. 6d. to 10s. each plus the cost of installation. The overall cost of subsequent back rips, arch replacement, etc., could soon be greater than this cost, plus the inconvenience factor of disrupting transport facilities, and the absorption of labour which could be more usefully employed.

Importance of Roadside Packs

Mr. H. B. BENNETT said he was pleased to hear the author give emphasis to the importance of roadside packs. He did not know the optimum length of roadside packs, but it previously paid to put on 20-yd. gate-side packs to maintain important roadways. He suggested that in difficult middle gates it would pay to establish back ripping at, say, 80-100 yd. from the face, and convey the stone to the lip in order to increase the length of gate-side packs, even to the extent of using mechanical means.

The AUTHOR replied that generally, where bad roadway conditions existed, the remedy lay in strengthening and lengthening the packs. The mechanization of ripping lips to a greater extent to improve efficiency was a possible solution. Available at present were mechanical slusher packers, and no doubt a method could be devised of ramming the material into the pack holes by using hydraulic rams.

Mr. H. WILCOCK said one of the problems was in handling the large arches in use today, and he asked if it was possible to achieve the same degree of support with an arch made in three or four pieces, this being easier to transport in comparable conditions. Replying, the AUTHOR said the more joints which were present in a structure, the weaker the structure would be, although it might be better from the aspect of transport and handling. It was easier to handle and set the three-piece arches now in use, but to go beyond this point would probably weaken the structure too much.

In reply to Mr. T. W. PETERS on the relative merits of slusher packing and pneumatic stowing, the AUTHOR said where slusher packing was used better roadway conditions were evident. Visible improvement in roadway conditions where hand packing had been replaced by slusher packing was obvious. This was usually due to a greater percentage of the material being packed. Mechanical packing methods available at the moment were, no doubt, cheaper and simpler to operate than having crusher stowers in the gate road.

Replying to Mr. D. SMITH, who enquired if there was an optimum maximum and minimum seam section for mechanical stowing, with slushers, the AUTHOR said that results from mechanical packing would be more beneficial in the thinner seams, but the system could be adapted to operate in seams as thick as 5 to 6 ft.

DEFECTS IN WELDS

Overcoming Inspection Difficulties

THERE is no simple answer to the complex question posed by "The Significance of Defects in Welds," Dr. Richard Weck, director of the British Welding Research Association, told members of the Society of Non-destructive Examination in his talk on this subject to the society recently. The subject, said Dr. Weck, was incompletely understood and there was a need for much fundamental work and for more data on service failures. The BWRA was active in both directions, but its present resources were rather inadequate for the task.

It was necessary to differentiate between defects in welds in construction subject only to static loading and those in construction subject to repeated or fatigue loading. The effect of a defect was twofold. Depending on its size, it reduced the cross-sectional area, producing a slight increase in the average or nominal stress. This effect could generally be entirely ignored under all loading conditions, unless the defect was very large in extent and produced a very considerable reduction in cross-sectional area.

The second, much more important effect of a defect was the production of concentrations of stress. Even this effect might be unimportant under static loading conditions, provided the material was in a sufficiently ductile condition to reduce the effect of stress concentrations caused by defects, by undergoing plastic deformation. When, however, a material was used below its transition temperature and if, in addition, residual welding stresses were present, defects played a very important rôle in the initiation of brittle fracture.

Fatigue Loading

Under conditions of fatigue loading however, the position was very different. The very high stress concentrations produced by defects might result in the production of premature fatigue cracks, with the possibility of early failure. However, even in this case, Dr. Weck did not believe that small, isolated pockets of porosity would have much effect, and he considered it was often a mistake to cut out such defects. Sharp corners might be introduced into the weld and be left in it after the "repair" had been completed. Such discontinuities had been shown to be capable of doing more damage than the defects which had been removed.

Sometimes many of the worst defects were those in the surface which could be seen with the unaided eye. Small internal defects which could only be revealed by elaborate and costly methods of non-destructive testing were probably the least important.

Dr. Weck declared he was not unduly worried about the possibility of failures occurring in butt welds in pressure vessels, but he felt there was some cause for concern about failures occurring in welds joining stand pipes to pressure vessels. Such welds were harder to make and very difficult to inspect properly. Coupled with this, they were subject to much higher stress concentrations.

It was often considered desirable to heat-treat welds to remove much of the residual stress. However, he was not sure that this was always really beneficial. There was recent evidence which appeared to suggest that if a defect was present at a place where there was a residual compressive stress, then the structure would be much safer in service if the compressive stress were not removed. In the case of a tensile stress associated with a defect, the evidence still pointed to the need to remove this stress. The general problem was, therefore, rather complex and it would depend upon circumstances whether heat-treatment was detrimental or beneficial.

Dr. Weck referred to a case where the weld contour had played a more important part in determining the strength of a weld under fatigue than defects. It had been found on comparing welds made by an automatic process with those made by manual welding that the latter had appeared to be much stronger than the former. The explanation of this was found to be that the hand welding produced a smoother contour between weld and parent metal than the automatic process, where the angle tended to be almost acute.

On the subject of acceptance codes, either in the form of diagrams or radiographs, Dr. Weck declared himself completely opposed to their use. There was not enough basic information available to permit such codes to be devised. So much depended upon particular conditions that it was not to be expected that useful guidance could be given by codes based merely on empirical considerations. No code could be a substitute for a properly educated inspection engineer, with a wide background of practical experience in design as well as inspection.

Molybdenized Lubricants for Mine Machinery

A new technical publication of Rocol, Limited, Swillington, near Leeds, entitled "Applications of Rocol Molybdenized Lubricants to Coal Mining and Associated Equipment," lists the typical uses of Rocol molybdenized lubricants under mining conditions, and gives the recommended detailed part applications to all makes of colliery machines and equipment.

FORTHCOMING EVENTS

FEBRUARY 15

Royal Society of Arts: Meeting at the society headquarters, John Adam Street, London, W.C.2, at 6 p.m.: "World and National Energy Resources," the first of three Cantor lectures entitled "The Fuel and Power Industries and National Prosperity," by A. Parker.

Institution of Electrical Engineers (Sheffield Sub-Centre): Meeting at the Angel Hotel, Brigg, at 6.45 p.m.: "DC Winder Drives using Mercury-arc Rectifier/Inverters," by L. Abram, J. P. McBreen, and J. Sherlock.

FEBRUARY 17

Midland Counties Institution of Engineers: Meeting at the Mines Rescue Station, Mansfield Woodhouse: "Development of an Experimental Ripping Machine," by C. V. Peake.

Mining Institute of Scotland: Meeting at the Royal College of Science and Technology, Glasgow: "Coal Clearance Underground—A Review of Transport Developments," by H. H. Wilson.

FEBRUARY 18

Institution of Plant Engineers (Blackburn Branch): Meeting at the Castle Hotel, at 7.30 p.m.: "Some Experiences with Chemical Engineering Plant," by J. C. Veale.

FEBRUARY 19

West of Scotland Iron and Steel Institute: Meeting at 39, Elmbank Crescent, Glasgow: "Application of Electron Microscopy in Steel Research," by F. B. Pickering.

FEBRUARY 22

Royal Society of Arts: Meeting at the society headquarters, John Adam Street, London, W.C.2, at 6 p.m.: "Production and Treatment of Coals and Oils," the second of three Cantor lectures entitled "The Fuel and Power Industries and National Prosperity," by A. Parker.

Institution of Plant Engineers (Birmingham Branch): Meeting at the Hotel Leofric, Coventry, at 7.30 p.m.: "Modern Welding Methods," by R. T. Andrews.

FEBRUARY 23

Combustion Engineering Association (North-Western Region): Meeting at the Engineers' Club, Albert Square, Manchester, at 2.30 p.m.: "Refractories for Kilns and Furnaces," by N. W. Hinchliffe.

FEBRUARY 25

Coke Oven Managers' Association (Northern Section): Meeting at the Three Tuns Hotel, Durham, at 7 p.m.: "Improvement of Coke Quality," by D. A. Hall and J. Gordon.

Society of Instrument Technology (Chester Section): Meeting in the premises of the English Speaking Union, Watergate Street, at 7 p.m.: "Automatic Control of Steel-rolling Mills," by W. N. Jenkins.

FEBRUARY 29

Royal Society of Arts: Meeting at the society headquarters, John Adam Street, London, W.C.2, at 6 p.m.: "Natural and Manufactured Gas," the last of three Cantor lectures entitled "The Fuel and Power Industries and National Prosperity," by A. Parker.

National Association of Colliery Managers

FEBRUARY 15

Midland Branch: Meeting at the Denman's Head, Sutton-in-Ashfield: "Development of the Mawco Cutter Loader," by N. Siddall.

FEBRUARY 24

Lancashire Branch: Meeting at the offices of the North-Western Divisional Board, Manchester, at 4 p.m.: "Recent Experiences of Caving in the St. Helens Area," by J. Abbott.

FEBRUARY 26

Kent Branch: Meeting at the Swan Hotel, Deal, at 7.15 p.m.: "Some Recent Developments in Underground Mechanization," by A. G. Douthwaite.

Case Hardening of Nickel Alloy Steels

A recent publication by the Mond Nickel Company, Limited, "Case Hardening of Nickel Alloy Steels," explains, with the assistance of numerous tables and diagrams, the object of case hardening steel components and the three processes employed, pack, gas, and liquid carburizing. Heat-treatment after carburizing is also dealt with in detail. The publication continues with information on core properties, fatigue, and carburizing defects and their elimination, and provides full information on the influence of temperature and time of carburizing on case depth. It is obtainable, free, on request from the Mond Nickel Company, Limited, Thames House, Millbank, London, S.W.1.

Engineering Materials and Design Exhibition

HIGHLIGHTS of the Engineering Materials and Design Exhibition, opening at Earls Court on February 22, will be a collection of more than 50 outstanding castings selected from firms throughout Britain by the British Steel Founders' Association, Sheffield, which it is hoped will show that there are now considerable facilities in this country for the economic production of components of all types for a wide variety of industrial purposes.

The examples which will be on display, either by actual castings or photographs, help to show how steel castings have replaced components previously fabricated or forged, how they have enabled a saving in direct cost of weight, and how overall economies have resulted with its longer life and reduced maintenance.

Various individual exhibits will attempt to show the wide range of modern foundry techniques. Direct cost saving is clearly shown by the diffuser vanes for atomic energy application, by the coal-cutter gearbox, by the winch gear ring and gearbox top cover for mechanical handling, and by the idler hub centre for earth moving equipment where steel castings have replaced fabrications with direct cost savings of from 12 to 60 per cent.

The bearing saddle casting also affords an example of a technique now becoming even more widely appreciated by designers. Nowhere have more marked advances been made in recent years than in the extension of the range of steels which can be welded. This has widened the application of sound engineering principles in the design of components and assemblies and is resulting in the increased use of steel casting—often in conjunction with fabricated or forged parts.

Examples of steel foundry designs, which have replaced other materials by reason of their greater resistance to a particular form of loading, are shown in a spiegel box for metals production, a furnace charging arm for steelworks' use, a wormgear case for mines and steelworks and a dragline bucket arch for earth moving equipment.

Graphs and charts demonstrate the centralized research activities of the British Steel Castings Research Association, and photographs of steel castings, including the 185-ton crosshead beam, the largest steel casting produced in this country for delivery to a United States forging press, will also be on show.

Construction of Tunnels and Culverts

A PAPER entitled, "The Construction of Shallow Tunnels and Deep Culverts," by G. A. JONES, dealing with two separate structures completed in South Wales, was recently given to the South Wales Institute of Engineers. In the first case a culvert had to be buried under a considerable height of filled material; these novel features were dictated by design considerations. In the second case, the decisions to drive an inclined drift through soft ground into rock, were dictated by performance considerations.

The object of the paper is to explain not only what was done in each case, but also why it was done, in the hope that an account of the reasoning which was applied to the design of both structures, and of the factors which were taken into account, may be of service to those faced with similar problems.

EFFECT OF GASES THROUGH HOLLOW ELECTRODES IN

Arc-furnace Melting

By J. A. CHARLES and A. G. COWEN

The electric-arc furnace is an efficient production unit in steelmaking and its application is continually expanding. In this article the authors describe work conducted by British Oxygen Research & Development, Limited, in which the use of injected gases through hollow electrodes to control the arc atmosphere and raise efficiency has been investigated.

A 1-cwt. capacity Birlec Model 2 arc furnace was selected for the work as offering the best compromise between reasonable operating costs and material handling requirements on the one hand, and the disproportionately high heat losses encountered in small scale experiments with molten metal on the other. A general view of the furnace is shown in Fig. 1.

Equipment

The furnace roof was formed of shaped Sillmax 63/100 Sillimanite bricks supported by a water cooled ring. When new, the roof tended to drip, causing fluxing of the basic side walls. This trouble, however, largely disappeared when the roof wore back to a reduced thickness and maintained a lower temperature during furnace operation.

After several introductory trials of various materials, the refractories for the walls and bottom were decided upon, as follows: *Insulation.*—1-in. layer Amberlite 12 concrete on bottom, 1-in. layer Amberlite GR23 tiles round walls; *Refractory.*—Rammed Permanente 165 (periclase) on bottom, Spinella A/C magnesite soaps round walls, rammed into place with Permanente 165. Such a lining gave a good furnace life and enabled comparisons of melts to be carried out with reasonably stable lining conditions, although patching was necessary from time to time.

The electrodes were 2¼-in. NDT Acheson graphite, having a ½-in. dia. centrally bored passage for introducing gas. It was found convenient to cut a door 6¾ in. by 4½ in. in the furnace shell which obviated the necessity for lifting the roof for observation, etc. During operation the doorway was closed by a Spinella A/C brick.

The circuit, shown in Fig. 2, was modified to include input ammeter, voltmeter and kW meter, furnace voltmeter and arc balance indicator, in addition to the standard instruments, furnace ammeter, kWhr. meter and kW meter. The input to the transformer was 415 V and the furnace voltage could be varied from 80 V to 140 V in 10-V steps. A variable reactance of from 10 to 40 per cent. in 5 per cent. steps was also provided, both alterations being made by selector switches which were a further modification to the furnace as supplied. During operation the maximum power taken by the furnace was about 90 kW.

Temperatures were measured by means of a Land H.F.3 immersion pyrometer (Pt/Pt.13 per cent. Rh couple, silica sheath) connected to an amplifier and Tinsley wall-mounted indicator. The pyrometer was inserted through the door.

The charge was standardized as 80 lb. steel scrap and 20 lb. phosphoric pig-iron, giving an average melt out composition of 0.6 per cent. C, 0.03 per cent. Si, 0.3 per cent. Mn, 0.3 per cent. P, 0.03 per cent. S. The steel scrap was in the form of " bow

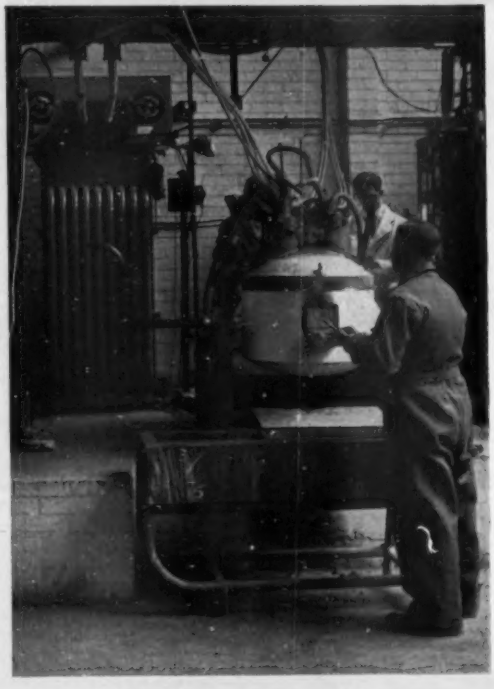

FIG. 1.—GENERAL VIEW OF INSTALLATION.

tie" punchings, about 3 in. long and ¼ in. thick, which gave a conveniently uniform charge.

The melts were cast into a trolley-mounted mould of Mansfield or Belgian sand. The electrical instrument readings were recorded photographically at intervals with a Graflex 35-mm. photo-record camera operated pneumatically. Other readings, such as weights, temperatures and times, together with any other observations, were recorded on a log sheet.

Experimental Procedure

Before each series of melts the furnace was preheated using a charge of broken electrodes on the hearth to a total electricity consumption of 50 kWhr. Every effort was made to obtain consistency of operation from melt to melt. The procedure was to pack the charge in as uniformly as possible and maintain the maximum power input during melting. Two arcs were established as soon as possible, although this was often only after clear melt had been obtained.

The judgment of clear melt presented some difficulties and it was the practice to open the door shortly before the estimated clear melt time and to push down into the bath any unmelted metal round the walls. The temperature at clear melt was recorded and taken into account when interpreting the results.

Careful records were kept of time off for slipping the electrodes and short circuits resulting in tripping of the circuit breaker, to give overall and net operating times.

Gas was introduced 3 min. after the start and continued for the remainder of the melting period. It was metered by rotameter at the rate of 1 cub. ft./min. through one electrode, except in the argon series 72-78 where 0.5 cub. ft./min. was passed through each electrode. The interval between melts was kept reasonably constant at about 7 min.

Despite these precautions there was some variation from melt to melt, so that at least one series (a day's run of eight melts) was devoted to each gas, and four series were carried out with solid electrodes as representing normal furnace operation.

The introduction of gases through hollow electrodes was obviously having a considerable effect on the arc characteristics and for this reason the arc voltage waveform was investigated at various stages of the melt using an oscilloscope and a high speed pen recorder connected between an electrode in operation and the furnace hearth.

Furnace Operation Results

The progress of the melt and the effect of introducing a gas through hollow electrodes could be judged reasonably well by ear alone. Solid electrode operation was characterized by a tearing sound corresponding to the rapid making and breaking of the arcs. This condition was extremely violent in the early stages of the melt and persisted with decreasing violence until clear melt, when two arcs could be maintained and the furnace was quieter, particularly once a fluid slag had been formed on the bath.

When argon was introduced through the electrode the furnace was quieter from the start and the melt was normally characterized by a quiet hum. Control was very much easier and the maintenance of two arcs was possible earlier in the melt.

Of the gases tried, the only other gas which gave a similar effect was nitrogen where the improvement was much less marked. Coal gas, carbon monoxide and hydrogen introduced through hollow electrodes rendered conditions less stable than those obtaining with solid electrodes.

The recorded values for (i) net melting time, (ii) overall melting time, (iii) kWhr. to clear melt and (iv) temperature at clear melt, together with the derived values, (v) mean power input (iii)÷(i), and (vi) mean rate of temperature increase (iv)÷(ii) are shown in Tables 1 and 2 for solid electrode melting and gas assisted melting, respectively. The first melts of all series have been omitted from the results as the furnace did not reach its normal operating state immediately after the preheat.

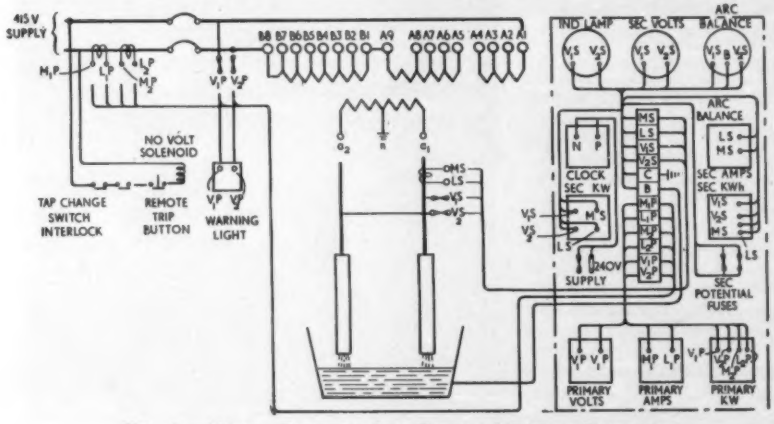

FIG. 2.—100-LB. ELECTRIC ARC FURNACE WIRING DIAGRAM.

No distinction is made in the results between the series 64-70 where argon was passed down No. 1 electrode only, and the series 72-78 where the same total flow rate of argon was divided between both, since the results obtained were very similar. This indicates that with the 1 cub. ft./min. total argon flow rate and the small size of the furnace, both electrodes are operating in an argon atmosphere, wherever the argon is introduced. In a large furnace, however, it

TABLE 1.—*Solid Electrodes Operating in Normal Furnace Atmosphere.*

Melt number.	Net melting time, min.	Overall melting time m n.	kWhr. to clear melt.	Clear melt temp., deg. C.	Mean power, kW.	Rate of temperature increase, deg. C./min.
48	23	25	28	1,530	73.0	61.2
49	30	31	32	1,520	64.0	49.2
50	24.5	25	29	1,520	71.0	60.8
51	24.5	26.2	27	1,530	66.1	58.4
52	29.3	32.3	34	1,530	69.5	47.4
53	29.7	33.7	29	1,500	58.6	44.5
54	28.5	30.3	26	1,500	54.8	49.5
56	30.75	32	30.5	1,525	59.5	49.3
57	33.25	36.25	33	1,510	59.6	45.4
58	31.25	34	33	1,570	63.3	50.2
59	36	36	37	1,545	61 6	43.0
60	29	30.5	27	1,530	55.9	52 8
61	23.5	24	27	1,530	69.0	65.0
62	23.5	25	28	1,525	71.5	64.8
81	31.25	34	34	1,550	65.3	49.5
82	29	29.5	27	1,515	55.9	52.3
83	25	27.5	27.5	1,500	66.0	60.0
84	32	36	30	1,525	56.3	47.7
85	28.5	30	30.5	1,530	64.3	53.7
86	30.5	33.5	29	1,540	57.1	50.5
126	24	24	31	1,550	77.5	64.6
127	33	34	36	1,520	65.5	46.2
128	30	31	31	1,525	62.0	58.3
129	27.5	28	30	1,520	65.4	55.3
131	25.5	26.5	24	1,525	56.5	59.8
Column average	28.5	30.2	30.0	1,526.6	63.6	53.6

would obviously only be practicable to introduce the argon into each individual arc.

It should be explained also that with the furnace there was a consistent tendency for arcing to be restricted to the right-hand (No. 1) electrode during melting, probably arising from the fact that with manual control the operator concerned could exercise greater sensitivity of movement on that side, and assisted possibly by a small degree of electrical unbalance showing as a slightly higher voltage to earth on No. 1 electrode. In view of this the use of only No. 1 electrode to carry the gas was a reasonable simplification.

Tables 1 and 2 can thus be considered as showing the effect of one variable (*i.e.*, the effect of the gas introduced or of solid electrodes) on the values recorded since all other variables were kept constant as far as possible.

The effect of the variable has been evaluated statistically because of the scatter in the results for any one imposed condition. The causes of this scatter are as follows: (*a*) Variations in the dimensions of the furnace lining and roof with use, fettling, and patching; (*b*) difficulty in exact consistency in operating technique with manual electrode control; (*c*) difficulty in exact judgment of clear melt; and (*d*) small variations in charge packing. The significance of the difference between the results for any pair of variables was tested by means of the relationship

$$\text{Var}\ (\bar{x}_1 - \bar{x}_2) = (\sigma_1^2/n_1) + (\sigma_2^2/n_2)$$

where, $\sigma^2 = \Sigma \dfrac{(x-\bar{x})^2}{n-1}$

$\bar{x}$ is the mean of a series of values x.

n is the number of tests

and Var $(\bar{x}_1 - x_2)$ is the variance of the difference between the sample means.

TABLE 2.—*Melting with Gases introduced through Hollow Electrodes at* 1 *cub. ft. per min.*

Melt number.	Net melting time, min.	Overall melting time, min.	kWhr. to clear melt.	Clear melt temperature, deg. C.	Mean power kW.	Rate of temperature increase, deg. C. per min.
Argon.						
64	22.0	22.5	27.0	1,525	73 5	67.8
65	23.0	24.5	28.0	1,540	73 0	62.8
66	22.0	23.5	24.0	1,515	65.4	64.5
67	26.5	28.0	29.0	1,545	65.6	55.1
68	20.0	20.75	26.0	1,520	78.0	73 2
69	21.0	21.5	25.0	1,515	71.5	70.5
70	21.0	23.75	25.0	1,485	71.5	62.5
72	20.5	20.5	26.5	1,550	77.6	75.6
73	24.0	24.75	27.0	1,540	67.4	62.2
74	22.5	22 5	26.0	1,505	69.4	66.9
75	22.0	23.0	24 0	1,540	65.4	67.0
76	24.0	26.25	27.0	1,530	67.5	58.3
77	21.75	22 25	24 0	1,550	66.2	69.6
78	22.5	23.0	27.0	1,570	72.0	68.2
Column average	22.3	23.3	26.1	1,531	70.3	66 0
Nitrogen.						
115	27.75	28.0	31.0	1,530	67.1	55.2
116	25.0	25.0	32.0	1,540	76.8	61.6
117	28.5	28.5	35.0	1,530	73.7	53.7
118	26.0	26.5	29 0	1,535	66.9	59.1
119	29 0	31 0	32.0	1,535	66.2	52.9
120	30.5	31.5	30.0	1,560	58 9	51.2
121	23.5	25.0	24.0	1,540	61.4	65.5
Column average	27.2	27.9	30·4	1,539	67.3	57.0

Melt number.	Net melting time, min.	Overall melting time, min.	kWhr. to clear melt.	Clear melt temperature, deg. C.	Mean power, kW.	Rate of temperature increase, deg. C. per min.
Coal gas.						
88	32 0	33 0	32 0	1,570	60 0	47.5
89	40 75	41.75	39 0	1,530	57 5	37.6
90	40 0	44 25	40 0	1,520	60 0	34.3
91	32 0	34 25	35 0	1,530	65 6	44.6
92	32 25	34 0	30 0	1,520	59 5	44.7
93	30.5	31.0	34 0	1,515	66.8	48.8
Column average	34.6	36.4	35 0	1,531	61.6	42.9
Hydrogen.						
99	47.5	51.0	43.0	1,505	54 3	29.5
100	40 25	41 0	36 5	1,480	54 4	36.1
101	37 5	38 0	32 5	1,500	52 0	39.5
102	37.0	38 0	32 0	1,565	51 9	41.2
103	41 0	54 25	35 0	1,520	51 2	28.0
104	46 0	46.0	33 0	1,520	43.0	33.0
Column average	41.5	44.7	35.3	1,515	51.1	34.6
Carbon monoxide.						
107	32 0	34.0	33 0	1,500	61 8	44.1
108	31 75	32.5	31 0	1,515	58 5	46.6
109	32.5	32 5	40 0	1,515	73 9	46.6
110	31 75	32.5	35 0	1,530	66 1	47.0
111	32.0	32.0	36 0	1,540	67 5	48.1
112	32 0	34.25	35 0	1,550	65 6	45.3
113	28.75	30.25	29.5	1,535	61.6	50.7
Column average	31.5	32.6	34.2	1,526	65.0	46.9

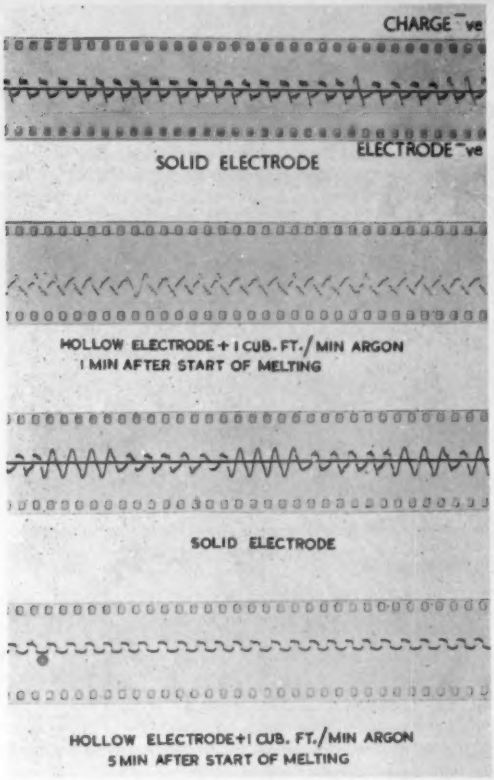
CHARGE -ve
ELECTRODE -ve
SOLID ELECTRODE
HOLLOW ELECTRODE + 1 CUB. FT./MIN ARGON
1 MIN AFTER START OF MELTING
SOLID ELECTRODE
HOLLOW ELECTRODE+1 CUB. FT./MIN ARGON
5 MIN AFTER START OF MELTING

FIG. 3.—OSCILLOSCOPE TRACES—ARC VOLTAGE.

The standard error of the difference between the sample means is given by $\sqrt{\text{Var}\,(\bar{x}_1 - \bar{x}_2)}$ and comparison of this with the difference between the sample means gives a measure of the significance of that difference. Conventionally, a difference between the sample means of two standard errors is regarded as "probably significant," while a difference of three or more standard errors is regarded as "definitely significant." The latter has an associated probability of 0.5 per cent. that the difference may have arisen by chance.

The effect on furnace performance of introducing a gas through the arc, judged by the mean power input (v) and mean rate of temperature increase (vi), gives an "order of effectiveness" as follows: (1) Argon; (2) nitrogen; (3) solid electrodes—(*i.e.*, normal practice); (4) carbon monoxide; (5) coal gas, (6) hydrogen.

Thus, only argon and nitrogen show any improvement over normal solid electrode practice. The superiority of argon assisted melting, both as regards mean power input and mean rate of temperature increase is definitely significant, as defined above, whereas no significance can be attached to the superiority of nitrogen assisted melting.

The effect of argon can also be noted in the increase of furnace efficiency as measured by kWhr. theoretically required ÷ kWhr. actually used.

Assuming, (i) Mean specific heat of charge during melting = 0.16 cal./gm./deg. C.; (ii) latent heat of fusion of charge = 3.63 kg.cals/gm.mol.; (iii) specific heat of molten charge = 0.20 cals./gm./deg. C.; then, total heat required at 1,500 deg. C. (100-lb. charge molten) = 15.92 kWhr.; also, heat required for T deg. C. of superheat above 1,500 deg. C. = 0.0106T kWhr.

Thus for solid electrode melting, temperature at clear melt = 1,527 deg. C.; therefore, kWhr. theoretically required = 15.92 + 0.29 = 16.21; kWhr. actually used = 30.0. Therefore efficiency = 54.0 per cent.

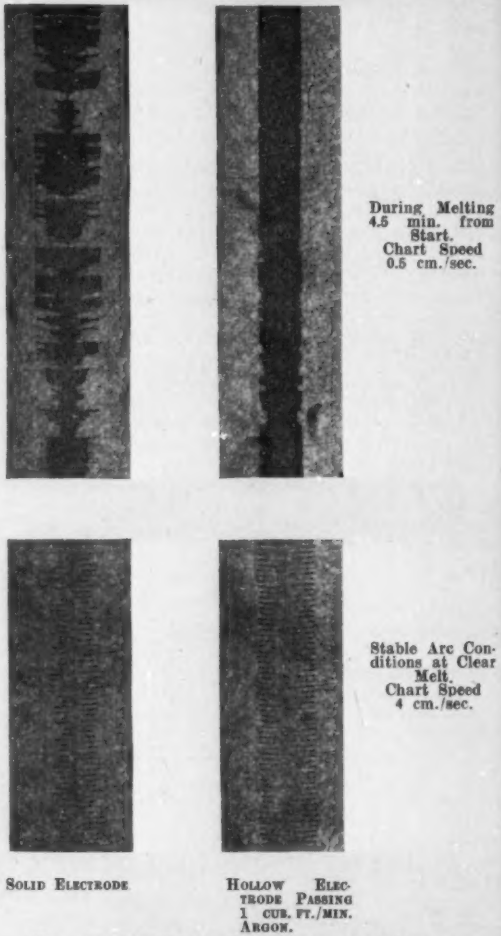
During Melting 4.5 min. from Start. Chart Speed 0.5 cm./sec.
Stable Arc Conditions at Clear Melt. Chart Speed 4 cm./sec.
SOLID ELECTRODE
HOLLOW ELECTRODE PASSING 1 CUB. FT./MIN. ARGON.

FIG. 4.—PEN RECORDER TRACES—ARC VOLTAGE.

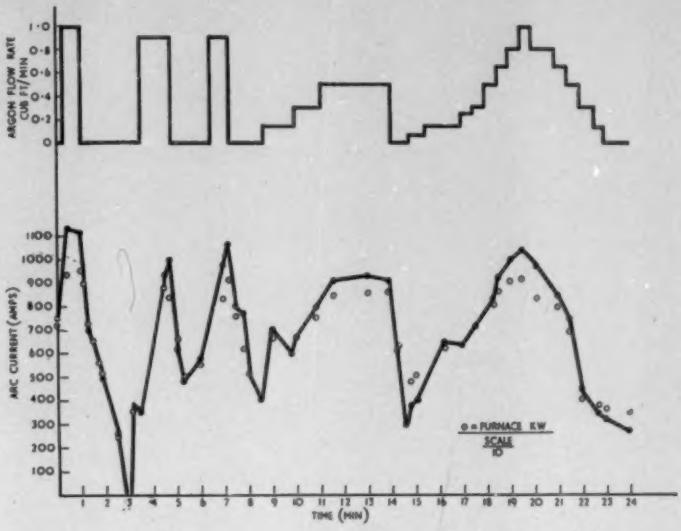

FIG. 5.—PRE-HEATING AT CONSTANT ARC LENGTH—VARIATION OF ARC CURRENT AT DIFFERENT ARGON FLOW RATES (BROKEN CARBON CHARGE).

For argon assisted melting, temperature at clear melt = 1,531 deg. C.; therefore, kWhr. theoretically required = 15.92 +0.33=16.25; kWhr. actually used = 26.1. Efficiency = 62.2 per cent.

Although no systematic measurements of electrode consumption were made there were indications of a slight reduction in consumption with argon assisted melting.

Arc Waveform

The use of argon through hollow electrodes was found to give greatly improved arc stability in operation and also a much quieter arc. This was reflected in the oscilloscope traces (Fig. 3). After 1 min. operation with solid electrodes there is consistent failure to establish a true arc when the charge is cathode and each positive half cycle is taken up by a large number of attempts to establish the arc. This is less marked in the trace shown for argon after the same period of melting.

After 5 min. melting the argon trace shows consistent arc reignition on both half cycles, whereas the solid electrode trace shows gross inconsistencies of arc reignition and variations of voltage when the arc does strike.

The improved arc stability is also shown by the high speed pen recorder traces shown in Fig. 4. Both after 4½ min. melting and after clear melt, the full voltage is obtained more consistently each half cycle when argon is being passed than during solid electrode melting, where the full potential is not obtained in many half cycles.

It was noted during operation that the introduction of argon resulted in a higher power input, and a proportionately greater increase in current which was due to the lower plasma resistance with argon passing through the arc. From Fig. 5, which shows the variation of current and power with argon flow rate under conditions of constant arc length during pre-heating with carbon/carbon arcs, it can be seen that the increase in current and power due to argon is proportional to the total argon flow rate up to the maximum used, 1 cub. ft./min.

Heat Distribution in the Furnace

Despite the care taken to standardize conditions the variation from melt to melt was sometimes quite considerable. In an attempt to correct the results for variations in clear melt temperature and time lost (*i.e.*, overall time—net time) investigations were made into the heat distribution of the furnace.

The aim of the investigations was to provide some basis for the corrections mentioned above by estimating the heat distribution during the complete melting cycle. To this end the following temperatures were measured by thermocouple, thermocrayon or optical pyrometer: (*a*) furnace lining between tapping of one melt and the charging of the next (optical pyrometer); (*b*) outside of the furnace shell at various stages of the melt (thermocouple and thermocrayon); (*c*) charge before power was turned on (thermocouple).

From these observations Fig. 6 shows the temperatures (*a*), (*b*), (*c*) during a typical melt where the time to clear melt is 28 min. and the overall cycle time is 46 min. While the exact shape of the curves is somewhat speculative, they do give a reasonably accurate picture of the heat distribution in the furnace throughout a cycle.

It is apparent that in the early stages of the melt the charge is picking up heat both from the power supply and the lining, whereas in the later stages it is picking up heat from the power supply and losing some to the lining. The loss of heat to the lining is particularly marked after clear melt when there is a high radiation loss from a comparatively smooth metal surface. Thus the rate of temperature increase of the metal falls off as clear melt is approached, the effect being accentuated by the higher rate of heat loss of the furnace as a whole at these temperatures.

The net time and kWhr. to clear melt were corrected for variations in clear melt temperature and time lost. The variations in clear melt temperatures were corrected for by estimation of the rate of temperature increase and kWhr./deg. C. rise in temperature during the super-heat period. Time lost was corrected for by estimation of the

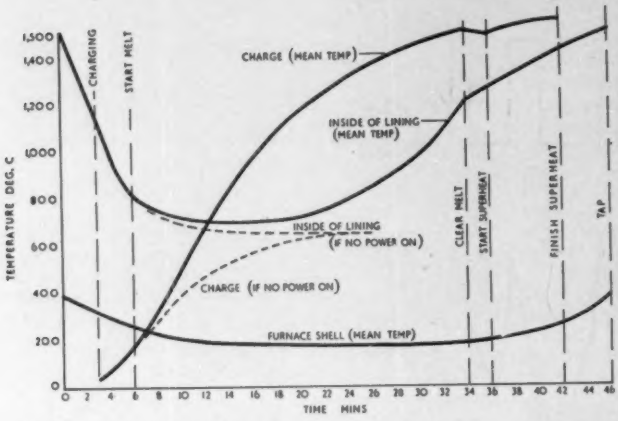

FIG. 6.—TEMPERATURE OF FURNACE AND CHARGE DURING CYCLE.

rate of heat loss and the mean power input during melting.

Corrected values are not recorded, since they gave a similar average and showed no more consistency than the uncorrected values. The ineffectiveness of the corrections is thought to be due to variations in clear melt temperature being largely caused by stratification and temperature gradients within the bath, and the difficulty in assessing the heat loss during periods of power off which occur mainly at the beginning of the melt.

Effect of Introducing Gases

Both qualitative and quantitative results indicate that, of the gases tried, only argon shows any significant improvement over normal practice with solid electrodes. The improvement due to argon can best be explained by considering the cathode processes which are the most important to the effect.

During the half cycle in which the carbon electrode acts as cathode, the current is carried mainly by electrons thermionically emitted from the carbon. With solid electrodes there is some delay in restriking the arc after passing through zero voltage and the restriking voltage varies. This suggests that at the beginning of the half cycle, the carbon is not hot enough for the required thermionic emission, the effect being accentuated by the random movement of the cathode spot to cooler areas.

In argon, however, the cathode drop, being of the order of the ionization potential of the plasma gas, will be greater than in air. Since cathode heating is mainly due to positive ion bombardment and the energy of the ions is proportional to the cathode drop an argon atmosphere will lead to increased cathode temperature and thus greater electronic emission.

During the half cycle in which the charge acts as cathode, thermionic emission does not take place and the cathode processes occur in an atmosphere of the metal vapour. Argon, however, will be present in the plasma and its presence will increase the proportion of ion to electron current. The greater proportion of ion current will in turn facilitate the emission of electrons.

Two of the properties necessary for this improvement in arc stability are a high ionization potential for effective cathode heating when the electrode is cathode, and a high degree of ionization once the ionization potential is exceeded in order to increase the proportion of ion current when the charge is cathode.

The stabilization of the arc is further improved by the increased arc length resulting for a given current when argon is introduced. This reduces the incidence of short or open circuits, thus enabling a stable arc to be maintained for longer periods. The effect of argon in reducing melting time and kWhr. consumed appears therefore to be derived from the higher rate of energy input possible with a more stable arc.

On the 1-cwt. furnace at BORAD this is an important consideration since the heat losses are high relative to the weight of metal being melted. On a large furnace, however, it is probable that the saving in time would not be accompanied by a proportional saving in kWhr. consumed, since heat losses would be relatively smaller.

Moreover, there might be less reduction of melting time on a furnace having automatic electrode control, since this would give more sensitive and rapid response to changing conditions.

Thus, while the beneficial effects of argon are well established for a small manually-operated furnace, it is not certain to what extent these benefits would be realized on a large scale. No assessment of the economic possibility of applying argon to large scale furnaces can therefore be made.

Conclusions

Both qualitative and quantitative results have shown that the introduction of argon through hollow electrodes has a stabilizing effect on the arc, which is reflected in a 22 per cent. decrease in melting time and 13 per cent. decrease in electricity consumption on the 1-cwt. manually-operated electric-arc furnace at BORAD. The introduction of nitrogen also showed an improvement over normal solid-electrode practice but no significance can be attached to this.

The other gases tried, coal gas, carbon monoxide, and hydrogen, made the arc less stable and resulted in longer melting times.

The authors gratefully acknowledge the assistance of Mr. F. W. Lunau in the electrical investigations and of Mr. C. H. King in all phases of the work. They also thank the directors of British Oxygen Research & Development, Limited, for their permission to publish this paper.

Electricity and Productivity

"PROCESS Integration and Instrumentation" is the title of the latest addition to the Electrical Development Association's series of "Electricity and Productivity" books. There have appeared recently a number of books on instrumentation, control, and automation, but few of these have dealt with the necessary units of equipment—"the building blocks"—which together allow various degrees of automatic working to be achieved. "Process Integration and Instrumentation" is designed to fill the gap, and has been written with the requirements of the industrial manager and production executive of the medium and small concern very much in mind.

A study of this new book indicates that the steps which lead from detection and measurement to indication, recording and eventually to automatic control are intricate and impinge on a wide range of specialized skills. Chemistry, physics, electrical, mechanical, electronic, and nuclear engineering are involved, it is shown, all of which have their peculiar and rapidly extending vocabularies. The book outlines in simple form the means by which the variables occurring in manufacturing can be sensed, measured, and controlled with the ultimate object of achieving a more completely and perfectly integrated process.

The new book covers a wide field and is written in a readable style without recourse to mathematical formulæ or references to abstruse points of design. Consisting of 200 pages, it includes 141 specially selected illustrations and covers in 13 chapters modern manufacturing, automatic control, sensing, instruments and instrumentation, electrical and electronic links, actuators and servomotors, industrial applications, computers, control of machine tools, movement of materials, quality control, design and servicing, and progress towards automation.

Copies of "Process Integration and Instrumentation" can be obtained from the EDA, 2, Savoy Hill, London, W.C.2, at 9s., post free.

English Electric Company Activities in 1959

DURING 1959, English Electric Company, Limited, received orders from the North of Scotland Hydro-Electric Board for two 19,000-kW vertical alternators, and one 22,000-kW vertical variable-blade water turbine. In the United States, the first two of four 68,000-h.p. water turbines were commissioned at Table Rock power station. These are believed to be the first water turbines of foreign manufacture supplied to the US. Installation has now started on the low-level embedded parts for the four 105,000-h.p. pumps and turbines being manufactured by English Electric for the Central Electricity Generating Board's Ffestiniog pumped storage station in Wales, which will be the largest in the world when completed.

Orders were received from the Central Electricity Generating Board for two 350-MW turbo-alternator units for Drakelow "C" power station, and for a 120-MW unit for Bankside "B" power station. Overseas, an important order was received for two 200-MW units for Vales Point, Australia, these being the largest single-line units so far ordered for any power station in the Southern Hemisphere. Further orders from abroad included a 30-MW set for Hex River power station, Electricity Supply Commission, South Africa, a 25-MW unit for Grand Pass power station, Government of Ceylon, and an order for a second 10-MW set from the Sudan Light and Power Company.

Among the major contracts awarded to the company by British steelworks were orders for mercury arc converter-fed drives for a hot reversing 144-in. plate mill for Consett Iron Company, Limited, and a hot reversing stainless-strip and jobbing plate mill for Samuel Fox, Limited, Sheffield. The plate mill at Consett is powered by a twin drive of 10,360 h.p. at a speed of 45/80 r.p.m. with a cut-out torque of 492 m.-t. Associated with the main drive are auxiliary motors having an aggregate output of 7,000 h.p. The stainless-strip and jobbing plate mill for Samuel Fox is powered by a 2,350-h.p. motor.

During the year orders were received for the electrical equipment of mine winders for home and abroad, the mechanical equipment forming part of each order. An order from South Africa covered the supply of a 5,400-h.p. Ward-Leonard winder, the 70 r.p.m. direct-coupled motor to be supplied from two 2,080-kW generators. Another from the National Coal Board was for a direct-current motor, developing 1,750 h.p., 350 r.p.m., fed by mercury-arc converters, the laminated frame construction being supplied by four converters for 12-phase operation.

Electric Winders for Australian Mine

A NEW shaft, equipped with AEI winders, is being commissioned for the North Broken Hill Mine, New South Wales, one of Australia's largest producers of lead, silver, and zinc ores. When the shaft is finished the winders will raise men and minerals from a depth of nearly a mile.

In the new No. 3 shaft, which at present is rather more than 4,000 ft. deep, the main cage and skip winder are each driven by twin d.c. motors having a combined rating of 3,000 h.p.; and a small cage winder is driven by an a.c. motor rated at 500 h.p., 460 r.p.m. The motor speeds of the main cage and skip winders are 53.8 r.p.m. and 64 r.p.m. respectively.

With this drive, the skip winder raises seven tons of ore at a rope speed of 49 ft./sec.—an hourly output of 224 tons. A complete wind takes 143.7 seconds. The 500-h.p. motor raises or lowers a load of 1½ tons at a rope speed of 20.8 ft./sec.

Identical Ward-Leonard motor-generator sets supply the twin d.c. motors on each large winder, which is also fitted with a brake governor and a servo-operated Ward-Leonard controller. These sets are equipped with hydraulic slip regulators and have 35-ton flywheels. Each winder may be supplied from either motor-generator set. The ore winder, which operates two skips in balance, has automatic control, but the cage winder for men and materials has manual control only.

All the electrical equipment for the winders was supplied by the heavy plant division of Associated Electrical Industries, Limited, at Manchester.

Metallurgical Progress

Some abstracts from recent reports on research and development, at home and abroad

Jet Cooling Speeds Continuous Annealing. ANON. ("Steel." 1959. Vol. 145; No. 12; p. 12.) In the processing of steel strip, the output of continuous-annealing furnaces is being increased with jet cooling. The unit at the Yorkville (Ohio) plant of the Wheeling Steel Corporation occupies 30 per cent. less production-line floor space than a conventional continuous furnace of the same capacity. Close temperature control is maintained at speeds of 500 to 1,200 ft./min. This helps to prevent strip breakage and ensures better metallurgical properties in the material.

A mixture of gases consisting of 8 per cent. hydrogen, and 92 per cent. nitrogen, is directed on to the strip by 54 jet-cooling units. This reduces the tinplate temperature from 482 to 121 deg. C. in the holding section. The independent jet coolers have their own motors and heat exchangers. They force the cooled gases at high velocity against the surface of the strip. Each of the units is accessible for simple maintenance and flexible operation. Coolers are attached to the furnace, and the number of jet units can be increased or decreased easily.

Jet cooling is effective at temperatures from 482 down to 38 deg. C. for furnaces operating up to 2,000 ft./min., processing up to 60 ton/hr. of steel strip. A test furnace, with a roll-centre height of 24 ft., was built to give tinplate four cooling passes. Thermal calculations were verified, and mechanical behaviour of the strip was evaluated at air velocities up to 120 m.p.h.

Alloy and Technique-control Structure of Ductile Iron. ANON. ("Steel." 1959. Vol. 145; No. 13; p. 137.) Producers of ductile iron are getting higher and more uniform magnesium recoveries by treating base iron with a new, richer magnesium alloy, and using better addition techniques. This method was developed in Germany. Addition is made by plunging the alloy into molten iron.

The alloy, in a light-gauge steel container, is fastened in a refractory bell and plunged deep into the iron. The bell resembles an inverted crucible, attached to a refractory-covered vertical shaft. Holes in the sides of the bell permit magnesium vapour to escape and bubble up through the molten iron. Part of the vapour is absorbed by the iron.

A high magnesium content of 30 to 32 per cent. often permits a smaller plunger or bell to be used. This minimizes temperature losses and equipment cost. High-magnesium to silicon content makes the alloy useful in treating acid-cupola iron. Sufficient magnesium can be added to remove sulphur and produce a ductile-iron structure without exceeding silicon specifications. As the alloy has a silicon base, a ferritic iron can be produced with high as-cast ductility.

Determinant Tempering. ANON. ("Iron Age." 1959. Vol. 184; No. 12; pp. 116-8.) This is a patented process and is a novel form of heat-treatment. Among the improvements in alloy-steel castings attainable by this process are the elimination of cracking due to cooling stresses, and improvement in tensile properties normally impaired by cracks, retained austenite, and carbon segregation. Other benefits claimed include a more uniform response from heat-treatment, elimination of many welding difficulties, and improvement of machinability, and wear resistance.

Determinant tempering is performed by subjecting the casting, during its initial cooling from solidification, to an isothermal treatment. The temperature chosen for this anneal is at the nose of the time-temperature-transformation curve for the particular alloy. Thus, pearlite transformation is virtually completed prior to the cooling of any part of the casting, to a temperature which will allow the formation of brittle martensite. Determinant tempering permits the casting of compositions not otherwise practical—*e.g.*, castings in the 0.60 to 0.80 per cent. carbon range or the 2.0 to 4.0 per cent. manganese range.

These alloys are susceptible to cracking. All carbon segregation is eliminated effectively by this process, and a microstructurally uniform carbon dispersion is obtained in the steel, even though initial-alloy segregation persists.

Use of Malleable-iron Castings for 650 deg. C. Service. H. J. HEINE. ("Steel." 1959. Vol. 144; No. 26; p. 85.) Research proves that malleable irons have good physical and mechanical properties up to 650 deg. C. Both ferritic and pearlitic types have been tested up to 2,300 hr. Pearlitic malleable irons appear equal or superior to unalloyed cast irons.

The stress-rupture curves for malleable irons do not reach a point at which they break sharply. Instead, they continue at a uniformly slight rate of decline beyond the breaks in the curves for some other materials. The tensile strength of malleable iron shows little change with temperatures below 370 deg. C. There is a high level of stress versus rupture time, equal or superior to other ferritic cast materials, particularly at 430 deg. C.

There was no evidence of abrupt changes in behaviour or structure during test periods of one to over 2,000 hr. All samples exhibited highly ductile properties and small likelihood of transitions or structural changes. The values obtained for pearlitic-malleable irons compare favourably with those published for molybdenum-alloyed irons. Pearlitic malleable irons appear equal to alloyed high-carbon materials containing up to 0.5 per cent. Mo, which has been added to enhance their elevated-temperature properties by stabilizing the carbide phase.

EXPLOSION AT ST. JOHN'S COLLIERY

HM Divisional Inspector's Report

THREE men lost their lives as a result of the accident at St. John's Colliery (Yorks), on September 26, 1959. Death in each case resulted from injuries following an explosion of firedamp, which was caused by a spark from a coal-drilling machine being used to extend a heading at the colliery, states Mr. H. J. Perrins, HM Divisional Inspector of Mines and Quarries, in his report on the explosion.

At the time of the accident 786 men were employed underground and 209 on the surface at St. John's Colliery. The daily output, obtained from the Silkstone, Eleven Yard, Blocking and Beeston seams was 1,600 tons, about one-third of which was from the Eleven Yard seam, where the explosion occurred.

The Eleven Yard seam is 2 ft. 4 in. thick and lies below a grey bind roof and above a few inches of dark fireclay beneath which is a stone bind. The workings in the seam were begun about seven years ago by the formation of 1's district, a double-unit longwall face, 200 yd. long dipping from right to left at 1 in 80. At the time of the explosion the face had advanced about 1,700 yd. in a south-westerly direction from the shafts. The coal on 1's face was undercut by machine, loosened by explosives and hand-filled on to face conveyors with a common transfer point.

Unit ventilation was practised, the air entering the loader gate and splitting when it reached the face, so that each tail gate served as a return airway. The last statutory measurement before the explosion showed that a quantity of 7,332 cub. ft. of air/min. was reaching the face; 4,320 cub. ft./min. was passing through the right tail gate, and 3,016 cub. ft. through the left. As the air in each tail gate was sampled at the same time and shown by analysis to contain 0.2 per cent. of methane, the total make of methane on the face was about 14 to 15 cub. ft./min., concludes the Divisional Inspector.

Events before the Explosion

Towards the end of May, 1959, a downthrow fault, with a displacement of between 3 ft. 6 in. and 4 ft. was encountered. In order to negotiate this fault a heading was driven from the loader gate to form the new face. At the same time, the right-hand side of 1's face was swung round, so as to strip as much coal as possible on the upthrow side of the fault. It was not possible to recover all the coal up to the fault and slits about 6 ft. wide were driven through this coal and through the faulted ground at distances of 40, 50, 64, and 80 yd. from the loader gate. When the face heading reached the first slit the face conveyor was transferred to the heading.

Each of the first three slits was successively continued diagonally to follow and ventilate the coal heading which was establishing the new face. After the heading reached the fourth slit the system of ventilation which had been followed up to that point was abandoned, and no other provision was made for ventilating the heading beyond the last slit.

The face heading had almost reached the tail gate heading by September 25, and a hole which was being drilled when the explosion occurred was possibly a proving hole. The tail gate heading was then not more than 4 ft. away but not quite in the direction in which the hole was being drilled.

The night shift, during which the explosion occurred, comprised a deputy and seven workmen. Two men were detailed to work in the heading and the job of the other five was to cut 35 yd. of coal from the cutting machine, on the right-hand face, to the loader gate. About an hour before the explosion three rounds of shots were fired in the heading.

The Investigation

After the explosion the manager inspected the heading and he found it clear of firedamp except for a small accumulation of about 3 per cent. confined to the top right-hand corner of the pilot heading. Before leaving he made an external examination of the drilling machine and noticed that it was defective. At about 9 a.m. one of HM Inspectors carried out an inspection and took an air sample at roof level which was found by analysis to contain methane in explosive proportions, namely, 11.94 per cent.

Signs of violence were slight and the system of ventilation, though momentarily reversed, had not been disturbed. Scorch marks on timber, charred paper and some small coke deposits on a few props, indicated that flame had extended for a distance of about 40 yd. back along the face from the pilot heading, which could have given a maximum volume of flame of about 3,000 cub. ft. Coal dust did not seem to have played any part in the propagation of the explosion, says Mr. Perrins.

The Igniting Agent and Source of Gas

The explosion was known to have occurred at a time and place where there was in use an electric

drilling machine, and after a series of tests it was concluded that the igniting agent was an incendive spark at the flange gap between the plug and socket coupling. The drill rod was found fast in the hole, and in an attempt to release it, the operator might have been twisting the machine and so caused movement to take place between the plug and socket of the cable attachment.

Apart from the heading, the standard of ventilation throughout the district was satisfactory; indeed any greater quantity of air passing through the right face might have caused discomfort to the men working there. However, it is quite clear, states Mr. Perrins, that at the time of the explosion necessary steps had not been taken to ensure that there was constantly produced in the heading, ventilation adequate for diluting gas.

On the shift on which the explosion occurred, and on the two preceding shifts, the drilling machine was used by at least two persons who appear not to have been authorized to operate electrical apparatus. The drilling of shot holes in coal is now carried out on a very large scale and a man can quickly become expert in operating electric drilling machines; it is possible that many persons who are not duly authorized are tempted to use them.

All persons who may have occasion to use a machine should be trained in accordance with the requirements of Section 88 of the Mines and Quarries Act, 1954, so that, if suitable, they may be duly authorized. They must be properly instructed in the operation of any machinery or electrical apparatus that may be specified, and special emphasis must be placed on the duty to report forthwith to an official of the mine any obvious defect which might impair the safe working of the machine or apparatus.

Summary of Conclusions

In summarizing his conclusions Mr. Perrins states that the explosion was one of firedamp initiated in the pilot heading being driven to win out the right side of 1's face. At the time of the explosion steps had not been taken for securing that there was constantly produced in the heading, ventilation adequate for diluting gases that were inflammable so as to render them harmless and to remove them in accordance with Section 55 of the Mines and Quarries Act, 1954.

The igniting agent was an incendive spark at the flange gap of the plug and socket coupling of a drilling machine which was being used at the time to bore a shot hole in a place in which inflammable gas, although not normally present, was likely to occur in a quantity sufficient to be a danger. The scheme for systematic examination, maintenance and testing of all electrical apparatus at the mine was not being fully implemented.

Dr. K. D. TOCKER, of the department of operational research and cybernetics of the United Steel Companies, Limited, is to address the Operational Research Society on "An Integrated Project for the Design and Appraisal of Mechanized Decision-making Control Systems" in the lecture theatre of the Royal Society of Arts, London, on April 20, at 6 p.m.

New Catalogues, etc.

THE following new catalogues, booklets, etc., have been received and are acknowledged with thanks.

J. E. LESSER & SONS, LIMITED, Hounslow (Middx)—Leaflet dealing with "Tenspan" industrial structures.

CROFTS (ENGINEERS), LIMITED, Bradford—Booklet dealing with a range of ½-in. pitch power-grip timing belts.

METALECTRIC FURNACES, LIMITED, Birmingham—Leaflet No. M.18A covering standard electrode salt baths.

BIRLEC, LIMITED, Birmingham—Brochure giving information on the company's general-purpose box furnaces.

ROCKWELD, LIMITED, Croydon—Catalogue detailing the Comet process for semi-automatic welding with CO_2 shielding.

IMPERIAL CHEMICAL INDUSTRIES, LIMITED, London, S.W.1—Leaflet dealing with Seismex, an explosive for land prospecting.

NU-SWIFT, LIMITED, Elland (Yorks)—Spiral-bound booklet containing detailed information on the company's range of fire extinguishers.

CHAMBER OF COMMERCE PUBLICATIONS, London, E.C.4—A guide for importers and exporters trading with the Soviet Union (price 5s., post free).

JAMES GORDON & COMPANY, LIMITED, Stanmore (Middx)—Catalogue No. 181, covering the latest flowmeter range manufactured by the company.

RAPID MAGNETIC MACHINES, LIMITED, Birmingham—Leaflet No. 123R, covering technical data about the type CB and DB overband magnetic separators.

RANSOMES & RAPIER, LIMTED, Ipswich—Leaflets No. 5/484 and 8/467 covering fork trucks and fork-truck cranes and diesel-electric shop truck cranes, respectively.

TURNER BROS. ASBESTOS COMPANY, LIMITED, Rochdale—Leaflet with information on aluminized asbestos cloth, the latest addition to the company's range of products.

SUFFOLK IRON FOUNDRY (1920), LIMITED, Stowmarket—Price-list No. 21159 (N) containing the complete range of SIF welding rods, fluxes, welding equipment, and accessories.

DANIEL ADAMSON & COMPANY, LIMITED, Dukinfield (Ches)—Brochure "Shell-type Boilers," describing the company's package, vertical, Lancashire, super Lancashire, and economic boilers.

FLUIDRIVE ENGINEERING COMPANY, LIMITED, Isleworth (Middx)—Booklet reviewing the different types of Vulcan-Sinclair fluid couplings and their development within the past 30 years.

ADAM MASON & SONS, LIMITED, Horwich, nr. Bolton (Lancs)—Brochure containing information on sleeves and rod covers, stoppers, nozzles, upcasting refractories, and miscellaneous fireclay shapes.

Deployment of Manpower at Collieries

In a paper given to the South Wales branch of the National Association of Colliery Managers, Mr. A. Walsh, deputy chairman of the South-Western Division, National Coal Board, outlined a new method of deploying manpower, using a card-index system and indicating signals between check points, which has been applied at Abergorki Colliery. The paper was published in the January 15, 1960, issue of IRON AND COAL (p. 129). We are asked to point out that a patent application has been made in connection with this system.

Metallurgical Patents in the US

Some Recent Inventions

THE following descriptions of metallurgical patents have been compiled from details given in the "Official Gazette" of the United States Patent Office.

Charging Apparatus for Blast Furnace

In a charging apparatus having a vertical axis for charging a blast furnace with ore comprising fines and medium and large pieces, an ore inlet aperture disposed on the axis has a deflecting device disposed below the inlet aperture obliquely of the axis and having a lower discharge edge which disposed nearer to the axis than to a vertical geometric cylinder based on the inlet aperture. A feeding device feeds the ore into the inlet aperature on the same side of the axis as the discharge edge, whereby there is provided a free passage for the fines which are able to fall in the form of a thin stream from the feeding device through the inlet aperture and past the discharge edge whereas the medium and large pieces of ore are received and deflected by the deflecting device toward the stream of fines.—2,897,984.

Casting of Metals

A continuous casting apparatus for metals comprises an open-ended mould, a reservoir for a metal to be cast, a duct for continuously supplying metal from the reservoir to the mould, wall means joining the mould at its metal receiving end to the reservoir, the wall defining a substantially closed gas space between the end of the mould and the reservoir. A gas pump is provided for supplying pressure gas to this space. There is a first normally closed and a second normally open valve. A first conduit connects the pump to the gas space through the first valve and a second conduit connects the pump to the atmosphere through the second valve, the pressure within the space controlling the rate of flow from the reservoir to the mould. Automatic control is effected by the level of metal in the mould which controls the flow of gas to the gas space to maintain a pressure holding the metal level within a predetermined range during operation. This control includes a first and a second control device responsive to a predetermined minimum level and a predetermined level, respectively, of the metal in the mould, the first control device opening the first valve means in response to a metal level above the minimum level to increase the gas pressure in the gas space and the second control device closing the second valve in response to a metal level above the maximum level to increase further the gas pressure in the gas space.—2,889,596.

Electric-arc Furnace and Preparing Castings

This is a method of simultaneously preparing a titanium base alloy and casting it into the form of an angularly-shaped flat casting. It comprises inserting within and in spaced relation to the walls of a substantially closed furnace, a mould having a flat bottom wall and an angularly-shaped casting cavity, feeding into a portion of the cavity of the mould a mixture comprising a predominant amount of titanium in the form of small particles and a minor amount of at least another metal in the form of small particles in such relative proportion to the titanium particles that it will form an alloy with the titanium when the metals are mixed together in the molten state. Sufficient electrical energy is applied to an electrode having a free end portion arranged in the cavity of the mould in proximity to the mixture of metal particles being fed into the cavity of the mould to melt the metal particles, alternately moving the mould in opposite directions in a horizontal path relative to the electrode and the mixture of metal particles being fed into the cavity of the mould to provide a uniform deposit of the molten metal within the angularly-shaped cavity of the mould. During the melting operation a gas inert to the metal particles being melted is pressed through the furnace to cool it and to remove from the furnace volatile impurities from the mixture of metal particles while they are being melted within the mould, and cooling the mould to solidify the metal deposited therein into an angularly-shaped flat casting.—2,881,489.

Slant Wall Construction for Furnaces

A continuous heating furnace, includes means for supporting elevated work, and a brick side wall comprising two sections of spaced solid blocks of ceramic material, the section above the top of the elevated means of work support being disposed in a vertical column and the section below the top of the elevated work support being disposed in a slanted position to present an inner upwardly and outwardly inclined face. Each of the ceramic blocks has opposed pairs of vertical and horizontal boundary surfaces, the blocks of the slanted column being disposed with their vertical surfaces aligned to present a smooth inclined inner face to the wall.—2,883,175.

Method of Centring Blast Furnace Bell

A method of installing the large bell and hopper in a blast furnace comprises machining annular seating surfaces on the lip of the bell and on the lower edge of the hopper, machining reference points on the hopper at points spaced axially from its lower edge and concentric to the annular seating surface thereon. The hopper is mounted on the furnace top ring, attaching the bell to a bell rod having an adjustable support on the bell lever platform by which its position may be adjusted relative thereto, measuring the respective radial spacing of the reference points relative to the bell rod, and then adjusting the position of the bell rod support on the platform to obtain a uniform spacing of the reference points relative to the bell rod and to thereby obtain a concentric arrangement of the seating surfaces relative to each other.—2,885,773.

Infra-red Heat in Industry

Entitled "Infra-red Heat in Industry," a new film is available from the General Electric Company, Limited. Explaining what infra-red heat is, it illustrates its applications to industrial processes such as plastics, paint stoving and nylon setting. The film is a 16-mm. colour/sound production and has a running time of 18 min. Applications for free loan should be made to GEC, Magnet House, Kingsway, London, W.C.2.

Substitutes for Tinplate

In most industries there are articles or materials, either existing or potential, with which a particular product must compete. With tinplate, these substitutes fall into two categories:—(1) *Ferrous baseplate with an alternative to the tin coating; and* (2) *materials consisting of neither steel nor tin.*

IN an appendix to his paper, "The Tinplate Industry with Special Reference to the Cold Reduction Plants of Trostre and Velindre," presented to the South Wales Institute of Engineers on December 10, 1959, J. S. GAZARD points out that in both these instances the location of the tin ore in the world plays a major part. For instance, the United States of America, with no tin supplies of its own, is constantly looking for alternatives to ensure a stronger position in case of international instability. In fact, this target is described as "Operation Survival."

Alternative Coatings

In the first category are:—

Lacquered Blackplate.—During the war, dry and certain non-corrosive packs had to be packed in this material because tin was in short supply. When tinplate again became more freely available, the use of this substitute rapidly diminished. Today, its field of application is very limited. This is a natural result of its poorer corrosion resistance, solderability, and appearance.

Chemically Treated Blackplate.—There are a number of proprietary products on the market, particularly in the US, such as bonderized blackplate based on a thin layer of metallic phosphates, and others which employ chromate films. The former was used during the last war for some food packs. The latter have found application in the packing of heavy duty detergents to which tin is vulnerable. In general, these products suffer from the same disadvantages as lacquered blackplate, although to a lesser degree, and will only find ready application for those packs to which special resistance is required.

Other metallic coatings, such as nickel and copper, are used for the protection of blackplate, chiefly in sheet gauge, but none of these products is competitive with tinplate. The possible exception is electrolytically deposited zinc on thin ferrous baseplate, which is now in production, in some instances in strip form. There may be some uses where it could displace tinplate to a limited extent. The tinplate manufacturer is essentially a steel roller, and if future research and development should produce a better coating material than tin, the partial or total substitution, although it would mean much reorganization, could no doubt be brought into line with present production, says the author.

Glass.—The present position is that in the packaging industry tinplate is making major encroachments on markets traditionally held by glass. This trend is likely to continue. Examples are the canning of beer, mineral water, and even water and wine. The tinplate container has many advantages over the glass bottle—it is non-returnable, more easily transported, gives greater physical protection, is more hygienic, does not break and, per volume packed, takes up much less room. On the other hand, it may sometimes be more attractive to be able to see the actual contents packed, than a paper or lithograph picture on a can.

Plastics, Polythene, etc.—Whereas tinplate is displacing glass, the reverse process is taking place in the case of plastics, but so far only to a limited extent. Plastic caps for the containers of medical and toilet preparations are slowly replacing tinplate. Children's toys, once universally made of tinplate, are now often most attractively and easily made from plastics. They are almost unbreakable, will not permanently distort or cut the hands, and are less noisy when used.

The increase in popularity of deep freeze equipment in the home with the use of plastic packs and polythene envelopers, etc., although more expensive overall to the consumer, is beginning to encroach into the market of foodstuffs once packed in glass and tinplate, but so far this has been accounted for by increased consumption of preserved foods and liquids.

In the foreseeable future, the great bulk of tinplate usage is not likely to be affected by competition from this substitute. Apart from cost, one of the chief disadvantages of plastics is its relatively poor mechanical properties, and it remains to be seen whether research can bring about any substantial improvement in this direction.

Competition from Aluminium

Aluminium manufacturers are making a serious attempt to invade the tinplate market. During recent years the battle has fluctuated, depending chiefly on the relative availability of the two materials, with aluminium making only minor and temporary inroads into the field where the use of tinplate has become traditional.

The main assets of aluminium are its resistance to external corrosion and the possibility of 100 per cent. recovery of used material. On the debit side is its high cost, its great difficulty in "soldering," and its low ultimate strength. Articles made from thin gauge aluminium readily become misshapen in use because of its extremely low yield point. Aluminium is a ductile metal, and by a new technique the body and one end of the open-top can, can be formed integrally by extrusion from a slug of the metal. The process is technically a success, but the high cost factor still remains, and the expense to the can manufacturer of scrapping existing body-makers for extrusion presses would be enormous.

Aluminium extruded tubes, and caps, both screw and press type for bottles, have in many instances taken the place of tinplate, especially where pres-

sure or processing is not involved. On the other hand, the use of aluminium for the traditional crown cork (which consumes 40,000 tons of British tinplate per annum) has virtually not yet been affected, although very serious efforts are being made in this direction, particularly in Scandinavia. So far, the cost and consistent reliability of tinplate have held the market.

The general situation with regard to alternative products, therefore, is that aluminium and plastics appear to be the most formidable rivals. Even these in the foreseeable future are unlikely to have any serious effect on the total envisaged consumption of tinplate.

Tinplate manufacturers will nevertheless have to expect further changes, some of which may fundamentally alter the pattern of present production. New methods will have to be studied to improve the quality and reduce the selling cost of the product, and this the trade has always realized, as its production is so personally and individually used. This being so, there is no reason to doubt that the healthy forecast predicted will be fulfilled, the author concludes.

IMPROVED MOBILE CRANE

THE 10-ton Jones KL 10-10 "Fast-Travel" mobile crane produced by K & L Steelfounders & Engineers, Limited, Letchworth (Herts), is to be replaced by a modified machine having a 12½-ton capacity. It will be known as the Jones KL 10-10 Mk. III.

The driver's cab has been redesigned, the original cab, which occupied the full width of the chassis, having been replaced by a "fore and aft" cab off-set on the off side. Two driving positions are provided, one facing forwards, for road travel, and one facing the rear, the latter being equipped with simplified "fingertip" crane controls together with duplicate travel controls arranged as in standard automotive practice. The crane can be supplied with either a strut or a cantilever type jib, and the newly designed cabin allows the latter to be lowered on to a bolster set beside the cab in such a way as to give a considerably reduced overall height when travelling.

An important change is the incorporation of a power lowering system as standard. By this system the braking action of the Leyland 0600 diesel engine is used to give smooth and steady lowering at speeds infinitely variable down to a matter of a few inches per minute. The handling of delicate loads and their precise positioning without shock is thereby made simple and sure.

De-watering at Rigfoot Field, New Cumnock

Problems in the de-watering and development of the Rigfoot Field, New Cumnock, are discussed by WILLIAM SPEIR in a paper presented at Glasgow on November 18, 1959, to the Mining Institute of Scotland. The author describes the problems confronting the management in de-watering and also covers the progress to date. The operations, from the surface reorganization at an existing colliery to the initial development of a previously abandoned field, are described stage by stage, and details are given of some of the added difficulties encountered in carrying out these operations.

Operating a Standards Department

A GUIDE to the principles and practice of applying standards in the individual firm, entitled "The Operation of a Company Standards Department," has been published by the British Standards Institution. The 18-page booklet is sponsored by a joint committee of the BSI and the Institution of Production Engineers. The members are standards engineers from a variety of types of firm, together with BSI and IPE officials. The function of this committee is to promote the efficient application of standards in practice and to advise on how British Standards can best serve this end.

Members of this committee have helped Mr. S. T. Robinson, standards engineer of S. Smith & Sons (England) Limited, to write the new booklet, thus bringing to firms and organizations less knowledgeable in using standards, the benefit of much experience in a wide range of industries.

The introduction to the booklet indicates some of the obvious sources of savings resulting from the efficient use of standards—reduction of stocks, ordering of larger batches, elimination of design and tooling costs for special components, reduction of storekeeping and inspection overheads. It makes the point, however, that an exact evaluation of such savings is difficult, if not impossible.

An outline is given of the fields covered by company standards and variety reduction. The easing of production problems resulting from standards collaboration between design office and factory floor is emphasized. Advice is next given on the actual writing of company standards.

The booklet emphasizes the necessity for full co-operation between the standards engineer and other departments in the company. The importance of classification and coding in standards work is explained and the general principles are outlined and guidance is given on methods of reproduction and distribution of company standards, and the layout and headings for a "model" standard sheet are illustrated. Copies of "The Operation of a Company Standards Department" can be obtained from the BSI, 2, Park Street, London, W.1, price 3s.

Simon-Carves Electro-precipitators for OH Furnaces

REFERRING to the report which appeared in IRON AND COAL, January 1, 1960, page 16, concerning the Koppers contract for electro-precipitators for open-hearth furnace gas-cleaning at Cornigliano steelworks, in Italy, Simon-Carves, Limited, Cheadle Heath, Stockport, point out that this was not the first such installation in Europe, as stated.

The company states that it had already built and commissioned the first precipitator on open-hearth furnace gases in Europe, which was completed at Scunthorpe in the spring of 1959, and it is now engaged on a repeat unit.

Colliery Shafts, Outlets, and Roads

AMENDED REGULATIONS

GENERAL regulations which the Minister of Power has made under Sections 141 and 143 of the Mines and Quarries Act, 1954, replace, with amendments, the Coal and Other Mines (Shafts, Outlets, and Roads) Regulations, 1956. They came into operation on February 1, 1960.

The effect of the amendments to the regulations is explained in the following paragraphs.

Cage Doors.—A new requirement is introduced that cage doors and gates must be so constructed that when opened they do not project outside the cage. This requirement will not take effect until February 1, 1961, to enable existing cages to be altered. Inspectors will have power to exempt from this requirement.

Prohibition of Spliced Ropes.—Spliced ropes were previously prohibited for winding men in shafts and staple pits. This is extended to ropes, other than endless ropes, used in unwalkable outlets in which persons are raised or lowered.

Life of Ropes in Unwalkable Outlets.—The life of ropes in unwalkable outlets in which persons are raised or lowered is now limited to two and a half years. Hitherto the maximum life of such ropes has not been prescribed. Inspectors now have power to extend the period of two and a half years, if satisfied that the rope can be used without danger for a further period.

Factor of Safety of Ropes.—All ropes installed after February 1, 1960, in shafts, staple pits, and unwalkable outlets, are to have a factor of safety of six and a half in relation to the maximum static load in normal working. Inspectors now have power to exempt from the requirement.

Maintenance of Winding and Haulage Apparatus.—Previous requirements providing for daily examination of shafts and staple pits in course of being sunk are extended to unwalkable outlets in the course of being driven. Similarly, ropes used in unwalkable outlets, as well as in shafts and staple pits, must be examined monthly.

The requirement as to six-monthly examinations of all apparatus used to attach the cage, etc., to the rope, is extended so that the gear has also to be examined as soon as practicable after (i) any occasion on which there has been an overwind and the detaching gear has operated, or (ii) in the case of a friction winder, any occasion on which there has been an overwind bringing into operation the braking appliances fitted in the head frame or the sump.

Heat Treatment of Cage Suspension Gear.—The former regulations required cage suspension gear to be annealed or subjected to other appropriate heat treatment at least once every six months unless an inspector gave exemption. This requirement is now varied by providing for the annealing or appropriate heat treatment either at six-monthly intervals or at such other intervals as may be approved by the Minister in relation to a particular steel. This proposal removes the need for individual exemption in each case where special steel is used. A power is left with inspectors to exempt from heat treatment requirements if, for any reason other than the material being a special steel, heat treatment is unnecessary or impracticable.

Shaft Signals.—The general code of shaft signals formerly provided no signal for "stop," for use when men were being wound and when the cage was in motion. The new regulations introduce a requirement that the signal used in mineral winding shall also be used in man-winding.

Signalling in Staple Pits.—The new regulations introduce a requirement regarding the provision and use, after February 1, 1961, of means of signalling in staple pits over 50 ft. deep corresponding to the provisions of Section 45 of the Mines and Quarries Act in respect of shafts.

The manager is to be given discretion to arrange, with the inspector's agreement, for winding in staple pits to be controlled by a "travelling onsetter" who travels in the cage with the men and gives signals direct to the winding engineman. This will be a permissible alternative to the system where there is a banksman at the top of the pit and an onsetter or onsetters at the lower landings. Under this system the manager must see that a competent travelling onsetter is in the cage when a person is carried or is to be carried. The travelling onsetter will be responsible for transmitting signals to the winding engineman.

Signals are prescribed to be given by the travelling onsetter when persons are being raised or lowered.

Signalling in Conveyor Roads.—Section 46 of the Mines and Quarries Act, 1954, requires conveyor roads more than 90 ft. long to be provided with signalling apparatus, but no particular signals had been prescribed hitherto. The new regulations prescribe a code of signals for the operation of conveyors.

Signalling in Unwalkable Outlets.—The previous regulations did not specify directly any code of signals for use in unwalkable outlets. Regulation 35 of the 1956 regulations refers to outlets and roads, but in practice outlets which are unwalkable have sometimes been treated for this purpose as if they were shafts.

Under the new regulations the manager must determine the signals to be used in unwalkable outlets and, except in an emergency, no person may transmit any other signals.

Refuge Holes.—The new regulations prescribe the maximum intervals to be allowed between refuge holes on locomotive roads. These intervals follow the distances fixed in a number of current special regulations.

Capping and Winding and Haulage Ropes.—The provisions relating to the factor of safety of cap-

pings have been revised so as to relate the strength of the capping to the load borne by it, without reference to the strength of, or load borne by, the rope. In addition, the strength required of cappings used in connection with haulage ropes, designed to carry persons through outlets, has been altered from 60 per cent. of the breaking strain of the rope to seven times the maximum static load during normal working.

Requirements as to the temperature of the socket of a capel during the pouring of white metal during capping have been amended for steel of a type approved by the Minister.

Extension to Staple Pits of Certain Shaft Requirements.—The new regulations apply to staple pits a number of provisions which previously applied only to shafts and unwalkable outlets. Other provisions—relating to overwinding, to the construction of cages and ancillary apparatus, to keps and to detaching gear, will be applied to staple pits after February 1, 1962.

Special Regulations.—Special regulations which were in force, prescribing maximum intervals between refuge holes on locomotive roads, are now revoked in favour of the requirement now incorporated in the new regulations. Exceptional cases will be dealt with by the issue of new special regulations. All other special regulations, varying the requirements of the existing code of general regulations, will remain in force and will have effect as if they varied the corresponding provisions of the new regulations.

Minister's Exemptions.—The former regulations contained several kinds of exemptions and authorities which had to be granted by the Minister and which could more appropriately be dealt with by an inspector. The revised regulations change the requirements accordingly. Exemptions and authorities granted under the 1956 regulations remain in force.

Statutory Forms and Books.—Certain provisions of the previous regulations requiring the use of books to be provided by the owner of the mine for recording information are preserved and in some cases extended in the new regulations. A new series of books will be made available, but the Minister proposes to provide also for the continued use of the existing books so as to enable stocks to be used up. Where, for example, a report will be required in relation to an unwalkable outlet and the relevant report book now in use refers to shafts only, it will be necessary for a suitable amendment to be made when entering a report on an unwalkable outlet.

The new regulations are known as the Coal and Other Mines (Shafts, Outlets, and Roads) Regulations, 1960.

Now available, is the 1960 edition of the "Gas Journal" Calendar and Directory, published by Walter King, Limited, London, E.C.4, price 30s. (post free). The book comprises a directory of the gas industry together with a handbook of technical data and trade directories.

Improved Ventilation and Dust Control in China

SYMPTOMATIC of the changed attitude in present-day China in relation to the health and safety of workers in mining and heavy industry, was the recent holding in the city of Changsha, Hunan Province, of a national conference convened by the Ministry of the Metallurgical Industry, to discuss problems of ventilation and dust control. Present at the conference were experts representing the Ministries of Mining and Public Health, in addition to the Ministry which sponsored the conference, the Department of Scientific Research, and numerous scientific institutions, institutes of higher education and hospitals.

Measures introduced in recent years, and education of the workers and managements in their proper application, were described and discussed. There was a general exchange of experience with various methods of ventilation and dust control, illustrated, in some cases, by practical demonstrations on the spot, in the course of which the representatives of one mining administration in Hunan Province described how a mass campaign for the encouragement of individual workers to propose their own ideas led to the adoption of over 30 innovations, including an automatic water curtain and an automatic water sprayer, as the result of which the silicon dust-content of the air in the mines had been reduced to less than 2 mgm./cub. m. of air.

Traditional Chinese methods, as well as the most modern Western methods, are being employed in the treatment of silicosis, and there was a most useful interchange among representatives of hospitals, medical institutes and scientific bodies of their experience with various special modifications which have been successfully introduced.

Layering of Firedamp

RECENT mine explosions have drawn attention to the danger of firedamp layering in mine roadways. "Layering of Firedamp in Longwall Workings," a paper presented by E. J. RAINE, B.Sc., to the Midland Institute of Mining Engineers on January 7, is an account of some practical underground investigations made in relation to layering of firedamp with a view to overcoming the hazard. Details are given of the cross-sectional distribution of air currents in a mine airway, with particular reference to maximum and fringe velocities and the effect of obstructions in low velocities.

Layering is defined, and the conditions in which layers form and exist are discussed. Evidence is given of reversed firedamp flow and recirculation of part of a layer as well as the effect on layering of barometric pressure and working operations. Methods of detecting layers of firedamp by means of methanometers, their removal by brattice sheets and compressed-air venturi tubes, and their prevention by methane drainage are matters also discussed.

The best solution to the problem of layering is considered to be a combination of strata drainage, effective roof control, and good ventilation.

Mr. Raine is HM South of England District Inspector of Mines and Quarries. His paper will be published in full in the "Transactions" of the Institution of Mining Engineers.

New Equipment and Products

Variable Flow Pump

MANUFACTURED by Sutcliffe Hydraulics, Limited, Castleford (Yorks), is a new hydraulic variable flow pump, Fig. 1, of the multi-piston type operated by camshafts which run in roller bearings. The delivery and suction valves are mitre-seated and the basis of the design is a simple unit construction, together with strength of components to give hard continuous service.

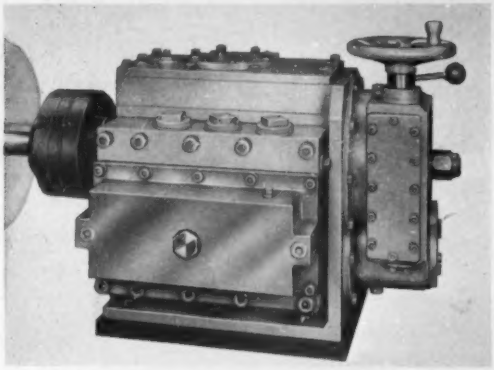

FIG. 1.—MULTI-PISTON TYPE VARIABLE FLOW PUMP.

Pairs of pistons operate with common suction and delivery valves and the relative position of the camshaft driving one piston is altered with regard to the camshaft driving the other piston, so giving an infinitely variable flow from zero to full capacity.

Full pressure is produced down to zero capacity and the pump may be run in either direction to suit the prime mover.

The present range of pumps have capacities from 7½ gal./min. to 50 gal./min., with pressures up to 2,000 lb./sq. in. and various controls such as manual, mechanical, electronic, or automatic can be fitted to suit the control required for various conditions.

The pumps can be supplied separately or in the form of power packs.

Combined Aftercooler and Anti-surge Tank

A COMBINED aftercooler and anti-surge tank for medium output stationary air compressors, has been produced by Holman Brothers, Limited, Camborne (Cornwall). It provides an improved method of cooling large quantities of compressed air after it leaves the compressor and before it is put to use.

Compressed air, as it leaves an air compressor, contains a certain amount of water and oil in vapour form. The amount it contains varies according to the humidity of the ambient air at the intake and the conditions under which the compressor is operating.

The new unit (Fig. 2) is designed to handle 525 cub. ft. of air per minute, at a maximum pressure of 150 lb./sq. in. It is compact and simple in design employing a four-pass system for the air flow. The cooling elements are "U" tubes, constructed from finned copper or copper-alloy tubing expanded into a fixed tube plate, through which the cooling water passes. Advantages gained from this system include accessibility and replacement of a cooling tube without disturbing the remaining sets and obviates the fitting of a second or sliding tube plate, as used in most designs.

Included in the unit is an anti-surge tank which eliminates air surges and consequent vibration in the pipelines, often caused through intermittent delivery from reciprocating-type compressors. The chamber acts as a cushion in the discharge, and with the anti-surge plate, ensures an even flow of air to the aftercooler tubes free from pulsations and also decreasing the noise.

When working to full capacity the aftercooler requires 16 to 18 gal. of water/min. The unit weighs approximately 750 lb. and is 25 in. long, 19¾ in. wide and 43¼ in. high. The air inlet and outlet ports are 4 in. dia. and the water inlet and outlet ports are 1½ in. dia. A drain cock is located near the base of the aftercooler so that water vapour condensate may be removed.

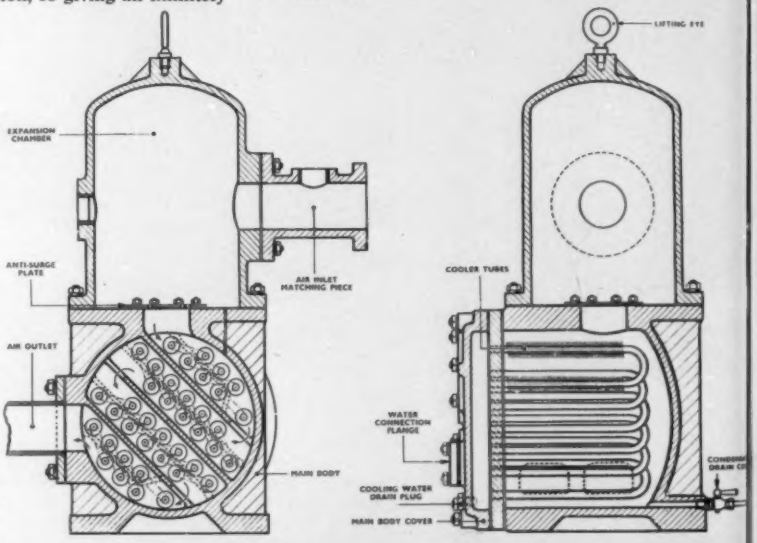

FIG. 2.—SECTION THROUGH THE COMBINED AFTERCOOLER AND ANTI-SURGE TANK.

BOOK REVIEWS

Mabon—A Study in Trade Union Leadership. By E. W. Evans. Cardiff: University of Wales Press. 10s. 6d.

PRIOR to the 1914-18 war almost everyone even if only remotely connected with the coal industry in South Wales, was familiar with the name of Mabon. Fewer perhaps would have recognized him as William Abraham. Today he has been almost forgotten although during his lifetime he enjoyed a nation wide reputation and his name will always be prominent in a history of the South Wales coalfield.

Any recollection of him will probably arise from his work in connection with the eight-hour day, the Workmen's Compensation Act, and above all the growth of trade unionism amongst the Welsh miners. He was pre-eminent as a leader for some 40 years in a period when there were more outstanding men in that category than at any other time. Mabon was born on June 14, 1842, into an environment of industrial activity and nonconformist tradition.

Mabon's religious convictions and an almost consuming desire for peace were undoubtedly in various ways a great handicap to him in dealing with a body of employers to whom the welfare of their workers was much less important than cheap coal for the export market. His solutions for the problems of industrial relationships were conciliation and arbitration which became the official policy of the South Wales miners' unions in the years of Mabon's supremacy. And it must be recorded that under the influence of his ideals, the coalfield experienced two decades during which no stoppage of the pits occurred.

But it is equally true that peace was preserved only by the workers under Mabon's influence accepting conditions of employment that many were gradually recognizing to be unjust. At the same time by encouraging the development of local miners' organizations he paved the way for the South Wales Miners' Federation which, forsaking his policy of peace at any price, soon plunged the coalfield into a period of prolonged and bitter industrial strife.

However, although Mabon's policy of pacification was ultimately rejected there was little doubt in the minds of those who were aware of the facts at the time, that in the circumstances prevailing it was the correct one, since recognized even by his most severe critics.

Polish Underground Transport. By Tadeusz Kubiczek. Katowice (Poland): Wydawnictwo Gorniczo-Hutwicze. 36 Zloty.

A LECTURER at the Mining School of Cracow (Poland), Dr. Kubiczek has just published a revised and enlarged second edition of his book on underground transport. The book is a paper-back edition and describes in 283 pages the principal machines and equipment used in Polish collieries for the purposes of coal-face transport, haulage and winding. The main formulæ are given to enable the principal dimensions and the performance of the machines to be calculated.

The book is not intended to teach the design of transport equipment, but 233 illustrations, many of them detailed sectional drawings, give a good insight into the constructional features. The chapter on conveyors deals with shaker conveyors in some detail, and with scraper-chain conveyors, belt conveyors, steel-plate conveyors and is concluded by some notes on maintenance and on safety devices.

The chapter on underground haulage describes rolling stock and track equipment, car-circuit devices, winches and endless haulages. The main types of locomotives are also mentioned, together with new developments of monorail and trackless conveyor systems.

Winding is covered in a shorter chapter, which briefly reviews skip, cage and suspension gear equipment. Winders, including brakes and signalling apparatus, are also described.

The book concludes with a short summary of experience with hydraulic transport, mainly based on official mining research in Poland and on experience in the Polish colliery Debienskio. Most of the machinery described is of Polish manufacture, but among the British equipment, mention is made of Sutcliffe belt-conveyor tensioning devices, and Distington rope belts.

The Schuman Plan—A study in Economic Co-operation, 1950-1959. By William Diebold Jr. London: Oxford University Press, Amen House, Warwick Square, E.C.4. 57s. 6d.

THIS is one of many publications issued from time to time in recent years by the Council of Foreign Relations, an American organization with headquarters in New York. The author, himself a citizen of the United States, is director of economic studies for the council, which is a non-profit making institution devoted to studying international aspects of political, economic and strategic problems as they affect the countries immediately concerned and indirectly the interests of the United States. The present volume, running to some 750 pages, includes copious notes and an extensive index.

To those interested, the plan has already become familiar at least in broad outline during the nine years it has been in existence, although the intricate details are still far from having been worked out. Indeed, it is fair to say that the book is more a description of attempts to render the plan generally operative and of the obstacles encounted in the process than it is a record of solid achievement.

Ideally, of course, the European Coal and Steel Community makes for the organization of economic activity on a broader basis than that of national policies affecting coal and steel; it tends toward a certain degree of harmony in the conditions of marketing; it alters the conditions of competition, encourages the exchange of goods, and thereby improves the chances for more economical conditions of production and marketing. But the author is obliged to admit that only a very preliminary interim balance of the community can be drawn as yet, and that, he says, is no model of clarity.

The Common Market, we are told, is far from perfect and the adaptation of coal and steel production to it is incomplete. To cope with some of the future problems the author considers that the community will need policies that are more comprehensive and more precise than those which have prevailed during the transitional period with which this book is largely concerned.

Iron-ore Prospecting in Pakistan

Prospecting for iron ore has begun in parts of West Pakistan. At Kalabagh, work has been started on two new tunnels to check on various strata of ore, as well as on the volume and intensity of iron deposits. Good quality iron ore has been found also in Waziristan, where geologists are surveying large areas to determine the extent of the deposits.

Training for Mechanization

SUCCESSFUL application of power loading requires not only plant and equipment, but also men who fully understand their part in the whole exercise and perform it at the right time with safety and efficiency, thus ensuring the effective use of machinery. Such a system of training for mechanized faces, in operation at Clipstone Colliery, East Midlands Division, National Coal Board, is described by H. Cusworth in "Outlook," Vol. 4, No. 8, Winter 1959-60, published by the NCB.

Trainees receive initial instruction on conventional part-production faces in the Top Hard seam fitted with AB cutters and 26-in. bottom-belt face conveyors. The wastes are supported with 4-yd. packs and two Butterley steel quick-release chocks in each 8-yd. waste.

Each man undergoing training is put with a supervising workman for 100 days, after which the training officer issues a certificate for filling, packing and drawing off, and ripping and packing.

The trainee is then moved into the Low Main seam as an assistant. The Low Main faces, 150 yd. long, are each equipped with a Meco-Moore power loader with hydraulic turret, cutting approximately 130 yd. in both directions. The loader stable hole is approximately 13 yd. long. and the feeder gate stable, 7 yd.

Dobson and Dowty hydraulic props support the face, under 5-ft. corrugated steel bars, and the wastes are supported by Butterley steel quick-release chocks. The face conveyor is a Meco 26-in. bottom-belt and the stables are undercut by individual AB cutters. The loader gate road is supported on 13-ft. arch girders on stilts and the feeder gate on 11-ft. arch girders. Cardox shots are fired in the coal.

The newcomer is first put to work in a stable hole at either end of a face where the various activities relating to the movement of the loader, and the operations involved in its backward and forward movement along the face can be observed. Moreover, because of the varying times of traverse from one side to the other and since the men employed in the stable hole are included in the face contract, the newcomer may move on to any section of work needing completion. Thus, if the power loader arrives early the men working in the stable hole move along the face to help complete operations behind the machine.

In this way they take a turn with the various jobs needing special attention, and their experience is widened day by day, until they can become equal members of the team.

Each face in the Low Main seam has a target of output and cycle of operations every 24-hr. The depth of cut is 5 ft. and the turnover aimed at is two per day. Output is about 3,856 tons per week, giving a face o.m.s. of 190 cwt., and an overall o.m.s. for the seam of 84.9 cwt.

Hydraulic Transport Techniques

DEVELOPMENT of horizontal hydraulic transport for mines has led to a few pilot installations and to numerous projects for hydraulic transport. Some techniques of hydraulic transport are described by L. VUCHOT and A. GINNOCHIO in a paper on methods of continuous extraction appearing in a special number of "Revue de l'Industrie Minerale," November, 1959.

The transported material is given a preliminary crushing below ground and is then introduced into a transport pipe containing water which is pressurized by pumps. In a closed circuit system, the circulating pumps are at the surface and the water is, after separation from the solid material, pumped back below ground in a return pipe.

In an open circuit system, the pumps take in the material in drainage lodges below ground and this is transported in the rising main.

Vertical Lifts

Laws of transportation for vertical lifts are very simple. The pressure losses are the same as for water because the material raised is evenly distributed over the cross-section of the pipe. Two conditions, however, must be observed. The diameter of the particles should be less than one third of the diameter of the pipe, and the velocity of transportation should be higher than two or three times the settling velocity of the heaviest particle in still water.

Under these conditions there is no risk of obstruction in the pipe and the velocity of the material raised is not very different from the velocity of the conveyed mixture.

Hydraulic transportation can increase the output of a shaft working to capacity or it may be applied to boreholes very close to the workings. When horizontal transport sections are added, the authors visualize a continuous transport system from the working places to the cleaning plants on the surface.

The velocity has a lower limit both for vertical and for horizontal transport if settling is to be avoided. In order to limit the pressure drop, the velocity must be taken as near as possible to this lower limit. The diameter of the pipe and the crushed particle size, which is less than one third of the pipe diameter, are derived from this minimum velocity.

If the nature of the material does not allow fairly fine crushing, for example coal, the diameter of the pipe must be increased and consequently the concentration reduced.

PRODUCTION of bituminous coal and lignite in the US during November, 1959, according to the Bureau of Mines, US Department of the Interior, amounted to 35,330,000 net tons in 23.8 working days, compared with 35,060,000 net tons in 27 days during October. Output in November, 1958, was 34,802,000 net tons in 23.8 days.

British and World Shipbuilding

LLOYD'S REGISTER RETURNS FOR DECEMBER QUARTER, 1959

STEAMSHIPS and motorships under construction in Great Britain and Northern Ireland at the end of December, 1959, totalled 276 ships of 2,032,600 tons gross, this being 65,164 tons less than the previous quarter and the lowest figure since June, 1956, according to Lloyd's Register Shipbuilding Returns relating to merchant ships of 100 tons gross and upwards. The total comprises 100 ships of 598,240 tons fitting out afloat, and 176 of 1,434,360 tons still to be launched.

The vessels under construction included 46 steamships of 972,443 tons and 230 motorships of 1,060,157 tons. In other Commonwealth countries there were under construction 8 steamships of 101,880 tons and 37 motorships of 116,385 tons.

Oil tankers building in Great Britain and Northern Ireland totalled 60 ships of 986,796 tons, which is 38,094 tons less than in the September quarter, and represents 48.5 per cent. of the total tonnage under construction in this country. Total construction in hand in the principal districts is indicated in Table 1.

TABLE 1.—*Shipbuilding Construction in Hand in Principal Districts of Great Britain and Northern Ireland.*

District.	December 31, 1959.		September 30, 1959.		December 31, 1958.	
	No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
Aberdeen ..	17	14,685	17	19,512	14	21,490
Barrow ..	3	92,500	2	67,500	2	67,500
Belfast	15	282,850	14	289,100	16	296,780
Bristol ..	3	4,544	2	3,844	2	4,850
Clyde:						
Glasgow ..	51	475,529	48	484,677	65	517,659
Greenock ..	22	164,519	23	160,620	29	193,910
Dundee	5	23,923	6	32,128	5	43,100
Hartlepool ..	3	31,690	3	25,710	5	36,240
Hull	37	14,564	43	15,621	39	16,642
Leith	9	42,334	9	40,826	10	49,000
Liverpool ..	11	123,547	13	130,857	11	112,053
Middlesbrough	9	137,172	9	137,632	15	194,164
Newcastle-upon-Tyne ..	31	369,634	33	391,476	36	423,032
Southampton ..	14	12,092	9	10,839	8	8,178
Sunderland ..	23	234,382	30	270,201	24	225,050

The sizes of steamships and motorships under construction in Great Britain and Northern Ireland included the following: 100 to 500 tons, steam nil (92 motorships); 500 to 1,000 tons, steam 2 (17); 1,000 to 2,000 tons, steam nil (11); 2,000 to 4,000 tons, steam 3 (11); 4,000 to 6,000 tons, steam 1 (5); 6,000 to 8,000 tons, steam 1 (21); 8,000 to 10,000 tons, steam 3 (24); 10,000 to 15,000 tons, steam 7 (45); 15,000 to 20,000 tons, steam 2 (1); 20,000 to 25,000 tons, 9 (3); 25,000 to 30,000 tons, steam 5 (nil); 30,000 to 40,000 tons, steam 8 (nil); 40,000 tons and above, steam 5 (nil).

Steamships and motorships under construction abroad at the end of December totalled 1,153 ships of 7,549,983 tons; a decrease of 165,810 tons since September quarter. As was then the case, no returns are available for China, East Germany, and USSR. Some of the leading countries abroad had the following tonnages under construction as compared with the previous quarter in parentheses:—Japan 1,207,050 (+185); Germany (West) 915,649 (−52,351); Sweden 767,739 (−80,649); Netherlands 744,918 (−19,971); Italy 707,069 (−79,502); France 623,767 (−58,807); US 603,130 (+36,343); Norway 381,850 (+42,918); Spain 294,554 (+11,950); Denmark 269,924 (+33,059); Poland 242,207 (−3,168). The decreases are shared almost entirely by the leading shipbuilding countries with the exception of Japan.

Oil tankers under construction abroad totalled 210 ships of 3,884,073 tons, which is 310,700 tons less than in the September quarter, and represents 51.4 per cent. of the total tonnage being built abroad. They include 35 of 682,450 tons under construction in Japan; 25 of 509,050 tons in Sweden; 24 of 461,830 tons in Italy; 23 of 382,739 tons in the Netherlands; 20 of 365,236 tons in West Germany; 12 of 347,558 tons in the United States of America; and 13 of 336,207 tons in France.

Apart from Communist countries, there are under construction in the world 1,429 steamships and motorships of 9,582,583 tons, of which 21.2 per cent. is being built in Great Britain and Northern Ireland. The present total is 230,974 tons less than last quarter. Oil tankers under construction in the world amounted to 270 ships of 4,870,869 tons (132 steamships of 3,427,178 tons and 138 motorships of 1,443,691 tons), which is 348,794 tons less than in the September quarter, and represents 50.8 per cent. of the total tonnage under construction in the world.

Of the steamships and motorships under construction throughout the world at the end of December, 5,234,214 tons (54.6 per cent.) are to be classed with Lloyd's Register. Of this total 1,979,198 tons, representing 97.4 per cent. of the tonnage being built there, are at yards in Great Britain and Northern Ireland.

Crompton Parkinson Activities during 1959

REVIEWING its activities during 1959, Crompton Parkinson, Limited, records some of the major contracts carried out by the company, including the extensive electrification work for the Ford Motor Company's paint, trim and assembly plant at Dagenham, the contract covering cables and switchgear, transformers, and high-frequency motor-alternator sets. A very large section of the company's business has, of course, been concerned with the electricity supply industry, and a number of contracts have been in hand for conventional power stations.

Work for the National Coal Board has been considerable and included 3.3-kV underground stand-by power cabling between two North Wales collieries. A large number of motors were supplied for a coal-handling and washing plant at a South Wales colliery and a number of contracts for cable and installation work and for the supply of switchboards in many other parts of the country.

New Patents

THE patents below are among the complete specifications accepted listed in the "Official Journal (Patents)." The numbers given are those under which the specifications have been printed and all subsequent proceedings will be taken.

Applications for copies of the full specifications (3s. 6d. each, post free) should be made to the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

Metallurgy and Engineering

821,652 ARMCO INTERNATIONAL CORPORATION. Precipitation-hardened welded castings.
821,871 BRITISH ALUMINIUM COMPANY, LIMITED. Determination of the gas context of liquid metals.
821,745 UNIVERSAL-CYCLOPS STEEL CORPORATION. High temperature alloys and the manufacture thereof.
822,109 STEINMÜLLER G.M.B.H. L. & C., WENZEL, W., SCHWENCKE, D., and SCHENCK, H. Lumping of fine-grained iron ores.
821,716 UNITED STATES STEEL CORPORATION. Method of continuously annealing steel strip.
822,050 INLAND STEEL COMPANY. Method of producing tinplate.
822,270 ARBED ACIERIES REUNIES DE BURBACH-EICH-DUDELANGE, S.A. Manufacture of steel.
822,138 MANNESMANN-MEER AG. Rolling mills having a reciprocatable roll carriage.
822,388 DEMAG AG. Furnace plant for the refining of pig-iron.
822,533 GENERAL ELECTRIC COMPANY. Grain oriented ingots.
822,040 BENDIX AVIATION CORPORATION Steel quenching process.
822,271 ARBED ACIERIES REUNIES DE BURBACH-EICH-DUDELANGE, SA. Manufacture of steel.
821,985 MORGAN CONSTRUCTION COMPANY. Repeater for rolling mill.
822,774 HÜTTENWERK OBERHAUSEN AG. Method of measuring the bath temperature in the blowing process for the conversion of steel.
822,944 LEEDS & NORTHRUP COMPANY. Methods of and apparatus for moving work into or out of metallurgical furnaces.
823,018 ALLMÄNNA SVENSKA ELEKTRISKA AB. Electric stirring means for metallurgical furnaces or the like.
822,870 PIEMONT, G. Endless conveyors.
823,175 METALLGESELLSCHAFT AG. Method of improving the adhesion of polyethylene coatings to metals.
822,831 PROPERZL, I. Device for guiding metal bars or rods during their passage through a rolling mill.
823,043 WAH CHANG CORPORATION. Purification of tungsten by recrystallization of normal alkali metal tungstate as the partungstate.
822,927 KING LIMITED, G. W. Conveyor systems.
824,122 BOCHUMER VEREIN FÜR GUSSSTAHL-FABRIKATION AG., formerly GUSSSTAHLWERK BOCHUMER VEREIN AG. Refining of steel.
824,333 STEEL COMPANY OF WALES, LIMITED. Steel manufacture.
824,334 METAL & THERMIT CORPORATION. Method for the production of chromium plated steel.
824,057 FOUNDRY SERVICES, LIMITED. Hot tops and the like for use in casting metal.
823,992 ADMINISTRATION-SEQUESTRE DES ROCHLING'SCHE EISEN- UND STAHLWERKE G.M.B.H. Converter steel with deep drawing properties.
823,923 CLIMAX ROCK DRILL & ENGINEERING, LIMITED, formerly CLIMAX ROCK DRILL & ENGINEERING WORK, LIMITED. Power-operated drill units.
824,394 DECKER, A. Method for the desulphurization of pig-iron and steel.
824,018 ARMCO INTERNATIONAL CORPORATION. Production of ferrous stock for vitreous enamelling.
824,031 ALLEGHENY LUDLUM STEEL CORPORATION. Process for producing stainless steel.
823,929 SUMMERS & SONS, LIMITED, J., and WILLOTT, R. L. Heating of furnaces.
823,615 MOTTA, A. Ingot stripper for steel works.
823,996 KLÖCKNER-WERKE AG. Method of refining phosphoric pig-iron.
823,589 KOPPERS G.M.B.H., H. Arrangement for drawing off the charging gases from a coking chamber oven.
823,369 WALTERISATION COMPANY, LIMITED. Surface treatment of metals.
823,428 BRITISH OXYGEN COMPANY, LIMITED. Treatment of ferrous metal.

Fuel Treatment and Utilization

824,658 SCHÜCHTERMANN & KREMER-BAUM AKTIENGESELLSCHAFT FÜR AUFBEREITUNG. Apparatus for separating material such as coal, according to density.
824,883 ATOMENERGI, AB. Method of burning sulphur-containing solid fuels.
825,284 TEXACO DEVELOPMENT CORPORATION. Generation of power from a solid carbonaceous material or fuel.
825,219 KONINKLIJKE NEDERLANDSCHE HOOGOVENS EN STAALFABRIEKEN N.V. Device suitable for receiving and discharging quenched coke from coke-oven batteries.

Amended Specifications Published

690,776 HOUILLERES DU BASSIN DE LORRAINE. Metallurgical coke.
741,935 HADFIELDS, LIMITED. Alloy steels.
801,518 DORTMUND-HORDER HUTTEN-UNION AKTIENGESELLSCHAFT. Degasifying molten metal.

BSI REPORT FOR 1958-59

THE growing demand of industry for new standards specifications on which to base production and purchasing requirements is reflected in the annual report of the British Standards Institution for 1958-59, which is available from the institution price 7s. 6d. (free to members).

According to the report, although there was a slight drop in the number of new standards published compared with the previous year, there was a sharp increase in new projects to be undertaken in the technical divisions: in the engineering division, 144 compared with 92 last year. Special features of the BSI's technical activities referred to are the co-ordination of the many existing standards for steel and other basic materials, progress on work connected with computers, continued efforts to develop standards for smoke control, and the preparation of standards on flammability of fabrics.

Growing support from trade and industry is marked by the substantial increase in subscribing membership; the total at March 31, 1959, was 10,605—an increase of 6 per cent. over the previous year's figure.

Company News

COLVILLES AND ALUMINIUM

"No Interest," Says the Chairman

REPLYING to a shareholder at last Friday's annual meeting in Glasgow of Colvilles, Limited, the chairman, Sir Andrew McCance, said that the company had no interest in aluminium and had not considered developing other alloys. They reckoned they had enough to do with their own steel interests, he added. He had been asked if the company had considered the development of aluminium and nickel alloys, now in greater use in shipbuilding.

Sir Andrew also received questions about the company's participation in the companies shipping iron ore to Terminus Quay, Glasgow. The chairman replied that the company had only an indirect interest in the ships through the British Iron and Steel Federation. The ships were in the hands of seven companies and the federation had representatives on the boards of those companies. He said he had a personal interest, as a director of one of them.

SIR ANDREW MCCANCE

When the shareholder went on to ask if those ore ships could not bring iron ore from the Labrador mines, Sir Andrew said that they were receiving ore from 27 countries, among them Labrador and Venezuela. He rejected a suggestion that on their return voyages those ships could carry steel products for the United States and Canada. So far as Colvilles was concernd, he said, the trade with the United States had never been of any great magnitude.

Harper Engineering Group Expansion

GIVING shareholders an indication of expansion policies of the Harper Engineering & Electronics, Limited, group, the chairman, Mr. N. C. Weaver, states in his annual review that it is not intended to lose impetus gained and to miss opportunities that might not recur. "Very large" projects are under consideration in the group's specialized fields of engineering.

Figures for the year to June 30, 1959, bear little relationship to the present size and earnings of the group and the board estimates that with comparatively little, if any, increase of issued capital, trading profits for the current year will be about £700,000, against the £251,635 for 1958-59. Turnover was £2,200,000 and this should be more than doubled.

The 1958-59 dividend is 30 per cent. on increased capital, compared with 20 per cent. previously. An extra-ordinary meeting will follow the annual meeting on February 29 to create a further 10,000,000 1s. shares.

C.V.A. JIGS, MOULDS & TOOLS, LIMITED—A dividend of 1¼ per cent. for approximately nine months ended September 27, 1959, compares with 2 per cent. for the previous year. Profit for the period was £65,297, against £84,320 for the year.

WAGON FINANCE CORPORATION, LIMITED—The dividend is being raised from 3s. 6d. to 4s. 3d. per £1 share, or from 17½ per cent. to 21¼ per cent., with a final of 3s. per share for 1959. Group profits, subject to tax, advanced from £533,948 to £602,758.

ALGOMA STEEL CORPORATION, LIMITED—A dividend of 30 cents compares with 25 cents previously. Steel output in 1959 was a record and net sales of $162,696,199 also established a new peak. Net profit was $3.05 ($2.04) per share. Operations are stated to be continuing at a high level.

CORNERCROFT, LIMITED, precision engineers, etc., of Coventry—The interim dividend is cut from 7½ per cent. to 5 per cent. Recession in the aircraft industry caused a steep fall in profits last year, when the year's payment was reduced from 22½ per cent. to 20 per cent. by the omission of the 2½ per cent. bonus payment.

UNITED GAS INDUSTRIES, LIMITED—The directors have decided to defer payment of a dividend on account of the current year until they have had an opportunity of seeing, over a period of 12 months, the effects of reorganization referred to by the chairman last August in his statement. A total of 6 per cent. was paid on the ordinary shares last year, but nothing was recommended on the deferred shares.

E. GREEN & SON, LIMITED, fuel economisers, etc., of Wakefield—The company has contracted to buy for £36,300 all the capital of Spurr Inman & Company, Limited, engineers and boilermakers, of Wakefield. On completion of the purchase the new subsidiary will keep its name and identity and continue to run under the present management. Existing staff and workpeople, of about 30, will be retained.

E. H. BENTALL & COMPANY, LIMITED, agricultural engineers and ironfounders, etc., of Maldon (Essex)—The offer to shareholders of 584,920 ordinary 5s. shares at 5s. per share has been accepted to the extent of 97 per cent. There were 229 applications received for additional shares totalling 278,410. The basis of allotment was:—50 and under, in full; 51-1,000, 50; above 1,000, approximately 4 per cent.

DOWTY GROUP, LIMITED—The interim dividend is increased by one point to 6 per cent. in view of a "satis-

factory" order-book and the prospect of continued improvement in trading. The company also intends to make a two-for-three scrip issue to shareholders. Estimated profits for the half-year ended September 30, after charging tax, are about £700,000. For 1958-59 a second interim dividend, in lieu of a final, of 6¼ per cent., tax free, was paid.

BIRMINGHAM RAILWAY CARRIAGE & WAGON COMPANY, LIMITED—The directors deny recent take-over bid rumours, but add that for some time they have been trying to find suitable means of diversifying the company's activities or improving its prospects in other ways. One or two projects have been surveyed and one is still under consideration. Discussions, however, are still preliminary. If anything more definite appears likely, all concerned will be informed promptly.

TOBENOIL, LIMITED, manufacturers of specialized machinery for packaging and parcelling goods, etc.—The interim dividend is halved to 5 per cent. Profits of Drum Reconditioners, Limited, continue to be good and the reduction in orders to another subsidiary, Ayers & Grimshaw, Limited, has now righted itself. New projects are in an advanced state of development and the results for the year to March 31 are expected to compare favourably with those for 1959.

CHAS. CARR, LIMITED, manufacturers of non-ferrous castings, etc., of Smethwick—Conditions during the first six months of the current year to June 30, 1960, have proved and are continuing to prove extremely difficult, as foreshadowed by the chairman, Mr. E. C. Marsland, in his annual address last October. In these circumstances and to conserve the resources, the board has decided to pass the payment of an interim dividend. A 7½ per cent. interim was followed by a 5 per cent. final in 1958-59.

QUALCAST, LIMITED, light repetition ironfounders, etc., of Derby—In an interim report to shareholders Mr. J. E. V. Jobson, chairman, states that orderbooks are in a "very healthy" state, while production is increasing steadily. He cannot foresee any "serious snags" for the period immediately ahead. In the first six months of the current financial year both production and profits are in excess of the like period of 1958-59, while the company is within 1 per cent. of its budget to date for the year ending June 30 next. The budget, of course, the chairman adds, is an increase over last year.

S. HUBBARD, LIMITED, manufacturers of felt and straw goods, of Luton—An agreement has been reached in principle for the acquisition by the company of the business and undertaking of Motor Gear & Engineering Company, Limited, Romford. The acquisition includes the fixed plant, loose tools, stock, and work in progress. Hubbard will take a lease of the Motor Gear & Engineering factory at Chadwell Heath, Romford, on terms to be arranged. It is intended that the purchase consideration, of about £200,000, should be substantially satisfied in the form of ordinary 5s. shares of Hubbard at 11s. a share.

CRABTREE ELECTRICAL INDUSTRIES, LIMITED—Announcing the maintenance of the interim dividend at 7½ per cent., the directors propose a one-for-one scrip issue and forecast a final of not less than 7½ per cent. on the increased capital for the year ending on July 31, 1960. This would be equivalent to 22½ per cent. on the present capital, as compared with 20 per cent. paid for 1958-59. As a result of revaluation, group fixed assets now exceed £1,200,000, compared with the balance-sheet figure of £571,000. It is proposed to increase the capital to £1,550,000 by creating a further 1,200,000 ordinary 10s. shares.

HILGER & WATTS, LIMITED, scientific instrument makers, of London, N.W.1—The equivalent dividend of 15 per cent. is being maintained with a 10 per cent. final for the year ended September 30, 1959. The previous final included a 2 per cent. special interim. A one-for-five scrip issue is proposed as well as a one-for-four rights issue at 21s. per 5s. ordinary share. The directors anticipate that they will be able to recommend dividends for the current year aggregating 15 per cent. on the enlarged capital. The 1958-59 net profit of £126,575 compares with £112,574 after tax of £109,385 (£113,376) and depreciation of £57,744 (£51,801).

SCAFFOLDING (GREAT BRITAIN), LIMITED—The directors have decided that the shuttering part of the business should be carried on by a wholly-owned subsidiary and that the rest of the business should be carried on by a second wholly-owned subsidiary. In this way, the company itself would become a holding company. It is therefore proposed that its name should be changed to Scaffolding Great Britain (Holdings), Limited, that shuttering business be transferred to a subsidiary called SGB Shuttering, Limited, and the rest of the business to another subsidiary which it is intended shall change its name to Scaffolding (Great Britain), Limited, as soon as the company has ceased to use the name.

MITCHELL, SHACKLETON & COMPANY, LIMITED, crankshaft makers and forgemasters, of Patricroft (Lancs)—The chairman, Mr. J. Mitchell, states that the outlook is at least a little brighter than a year ago, even though the prospects for the heavier side of the company's products continue to be worrying. Any schemes of expansion and modernization have not been abandoned because of the rather lower level of activity. These, the chairman says, are essential if the company is to meet heavy competition, particularly from the Continent. The pressing needs are for increased productivity and improved quality of workmanship, coupled with economic stable prices and reliable delivery promises.

Cozens & Sutcliffe's Bid for Redler

COUNTER-BID made for Redler Industries, Limited, referred to in last week's IRON AND COAL, was made formally last Friday by Cozens & Sutcliffe (Holdings), Limited, the Enfield (Middx) structural engineers and contractors. Cozens & Sutcliffe has offered to purchase the ordinary shares of the company on the basis of four ordinary shares of 4s. each of Cozens & Sutcliffe for every five ordinary Redler shares of 4s. each.

The previous offer, by Ley's Foundries & Engineering Company, Limited, Derby, was of 12s. a share in cash.

Cozens & Sutcliffe has for the last five years paid a dividend of 30 per cent. per annum, payable half-yearly, and it is the directors' intention to pay a half-yearly dividend of 15 per cent. on the ordinary share capital as increased as a result of this offer on August 26.

The directors of Cozens & Sutcliffe state that the group's trading results for the six months since June 30 last compare favourably with those for the corresponding period of the previous year.

The directors of Redler Industries, who had unanimously recommended the bid by Ley's Foundries, and have agreed to accept in respect of their own holdings, said last Friday that if the Ley's offer should not become unconditional they intended to accept the Cozens & Sutcliffe offer in respect of their holdings.

THE COAL TRADE

"MANY pits in Monmouthshire are finding it difficult to keep going," said Mr. Will Whitehead recently. The president of the South Wales Area of the NUM was referring to the effect of the shortage of railway wagons which is holding up deliveries from pitheads to distribution points. Complaints about the situation continue to come in from a number of districts. But the chief concern this week, of course, has been the threatened national rail strike. The Coal Board has been in close touch with the Government.

LEICESTERSHIRE

The domestic market continues firm and there has been a hardening of house-coal supplies. Contract tonnages are not now so promptly despatched and most coals offered recently outside contract have been withdrawn. The scarcity of low-group coals continues and most depots are lifting heavily from stock to augment supplies by rail. Demand outstrips supply and a time-lag between ordering and delivery is inevitable if the cold weather continues. Open-cast supplies put down at producing points are being lifted. Supplies of all grades of anthracite continue to improve and "Phurnacite" is still popular. Wagons are despatched promptly and roadborne traffic is easily loaded. There is some public reaction to "Warmco" and "Cleanglow," which are both available for quick delivery by road. The market for domestic coke is also firm, but good supplies of all types are available both by road and rail.

The central-heating market is still firm. All types of hard, g..s, and foundry coke are in good supply.

There is little change in the industrial coal market and pressure remains strong from consumers.

Coal Chartering

ONCE again the main interest in the coal market from Hampton Roads is centred on Japanese discharge and quite a fair volume of tonnage has been fixed. While 11,000 tons secured $8.75 for February 10-25, other fixtures have shown some variation in rate, 13,000 tons for February 25/March 15 accepting $8.50, 12,000 tons, March 1-31, $8.45, and 13,500 tons for similar position $8.40. Other fixtures from the Roads include a 14,000-tonner to West Italy at $4.55 for early loading, Trieste paid $5.85 for large and 8,300 tons for early loading was fixed for the same destination at $6.00.

Further tonnage has been fixed from Gdynia or Gdansk to Buenos Aires at 38s. for 8,600 tons March 1-15, and a slight reduction to 37s. 6d. for 11,000 tons, April. Same loading range/Leixoes reports 30s. for 4,000 tons, January/February, and 11,500 tons for February 5-15 to Karachi at 45s. 6d. There is no particular strength in the continental rate to the Mediterranean, and Rotterdam/Savona reports 18s. for 7,300/7,800 tons, February.

Durban/Rotterdam fixed 8,500 tons anthracite for April 1-25 at 52s. 6d., f.i.o. and trimmed.

MINERS AT Wharncliffe Woodmoor Colliery, Barnsley, who went on strike last Friday because of a pay dispute involving 30 fillers in the Lidgett Seam, decided to resume work on Monday so that negotiations with the management could begin. The fillers walked out on Wednesday of last week, complaining that they were underpaid.

Formal Opening of Brynlliw Colliery

SIR JAMES BOWMAN, chairman of the National Coal Board, will formally open Brynlliw Colliery today (Friday). Brynlliw Colliery is a recommissioned colliery and forms one of the major projects of reorganization and development in the South-Western Division of the NCB.

Sir James, who will be accompanied by Mr. D. M. Rees, chairman of the South-Western Divisional Coal Board, and Mr. J. G. Tait, Area general manager of the No. 1 (Swansea) Area of the divisional board, is due to arrive at Brynlliw at 9.45 a.m. He will be met by Mr. G. S. Morgan, production director, Mr. R. C. Lancaster, deputy production director (planning), Mr. J. D. H. Davies, Area production manager, and Mr. J. W. Lakin, mining engineer-in-charge of the project and who is now Area safety and dust suppression engineer. The party will spend some time inspecting the underground working of the pit before taking lunch in the canteen.

After an address by Mr. Tait, Sir James will unveil the plaque. The vote of thanks will be proposed by Mr. Rees, who will be supported by Mr. Trevor James, miners' agent, and Mr. D. N. M. Davies, agent/manager of the colliery.

Brynlliw Colliery has been reorganized and re-equipped at a cost of between £700,000 and £800,000 and it is regarded as one of the best reorganizations carried out in South Wales. Miners at Hendy Merthyr and Clydach Merthyr collieries nearby are likely to be transferred to Brynlliw after their pits are closed down, some time this year, it is expected.

Quarrymen Join Miners' Fatal Accident Relief Society

SIR ROBERT MARTIN, chairman of the Midland District Miners' Fatal Accident Relief Society, spoke at the quarterly meeting of the society on Saturday about Leicestershire quarrymen joining the society. He said: "So far 137 men have been enrolled at five quarries and it is hoped there are going to be additions to that number later."

Consideration is also being given to the admission of men employed by the National Coal Board on its housing estates, and the necessary alteration of rules was discussed.

There was a decrease of 362 members in the quarter and an increase of seven deaths, to 29. Beneficiaries increased by 11, to 1,608.

Law Cases

EARNING CAPACITY LESSENED

JUDGMENT for damages for personal injury and costs was given against the Santon Mining Company, Limited, Treeton, near Rotherham (Yorks), at Lincolnshire Assizes. Mr. Justice Jones awarded Mr. Harry Grimes £1,375 10s. for injuries received when an electric shuttle car he was driving at the company's ironstone mine collided with a wall. The plaintiff claimed that the steering and braking mechanism were deficient.

The judge said that he found that the company failed adequately to repair and maintain the vehicle and in this respect it was negligent. Although Mr. Grimes was still employed by the company—earning 10s. a week less than before the accident—he had now lost some earning capacity.

CRANE SLING WAS "LION'S MOUTH"

DAMAGES for negligence were claimed from the United Steel Companies, Limited, by Mr. Robert Chambers, 62-year-old machinist, at Brigg County Court. He alleged negligence on the part of a crane-driver who had tightened a sling when lowering material on to his machine. The plaintiff's fingers were trapped.

Stating that he would deliver judgment at the next Scunthorpe County Court, Judge Ralph Shove said there was the question of contributory negligence to be considered. "Surely," he said, "it is a rash thing for a man to put his hand into the lion's mouth without making sure that the keeper who is controlling the lion is aware of it."

FORGETFUL STRIPPER

FOR leaving a canister of explosives hanging on a steel pitprop underground at Mary Colliery, Lochore (Fife), John Duncan (34), formerly a stripper at the colliery, was fined £4 at Dunfermline Sheriff Court. It was stated that the canister contained 5 lb. of explosives. Duncan forgot it until he reached the pit bottom at the end of his shift. He asked a deputy if he would collect it and give it to one of Duncan's mates to bring to the surface.

There having been a very considerable tightening up in security regulations regarding explosives, the deputy refused to have anything to do with the canister and advised Duncan to go and collect it himself.

Joint Embassy Planned for European Communities

DIPLOMATIC mission in London of the High Authority of the European Coal and Steel Community is to be discontinued, it was announced on Monday. Instead it is proposed that there should be a joint embassy representing the three Communities—ECSC, European Economic Community (Common Market), and the European Atomic Energy Community (Euratom).

It is understood that the present High Authority representative in London, Mr. E. N. van Kleffens, is likely to remain in office and that he, or his successor, will represent the Communities and not merely the executive bodies. He would therefore represent the six Governments in the matter of Community interests, besides the administration of integrated Europe.

A similar change is proposed in Washington.

New Steel Production Record

NEW record for steel production was reached in January when the average weekly rate of 471,400 tons compared with the previous highest rate of 458,600 tons achieved in November, 1959, and with 356,900 tons in January, 1959. Production last month was, therefore, about one-third higher than a year ago.

In its production statement issued yesterday (Thursday) the Iron and Steel Board points out that after allowing for the normal annual holidays and the holidays affecting the January figures, it is estimated that production in January was at an annual rate of 23,600,000 tons, or about 17 per cent. above output in 1959.

For 1960 as a whole production is expected to be about 24,000,000 tons or 20 per cent. higher than in 1959.

Pig-iron production in January also reached a record figure of 297,500 tons, compared with the previous best figure of 285,500 tons in October, 1957, and with 228,700 tons in January a year ago.

Latest pig-iron and steel output figures (in tons), with the corresponding 1958 and 1959 returns, are shown in the following table:—

Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1959—November ..	277,300	14,422,000	458,600	23,847,000
December ..	280,400	14,583,000	432,900	22,513,000
1960—January ..	297,500	15,470,000	471,400	24,511,000
1958—November ..	233,700	12,155,000	351,900	18,299,000
December ..	223,100	11,602,000	313,100	16,282,000
1959—January ..	228,700	11,894,000	356,900	18,560,000

Steel Industry Expansion Affects British Oxygen

GENERAL increase in home sales in the first quarter of the current financial year may become greater as the year goes on, states Mr. J. S. Hutchison, chairman of the British Oxygen Company, Limited, in his annual review. Profit growth in the home gases division is likely again to be moderate, but profits from chemicals, equipment, and electric welding should show improvement.

Profits of oversea associated companies now represent almost half the group's total earnings.

New contracts for the supply of industrial gases to the steel industry have increased commitments for three years from £24,000,000 to £28,000,000 and this new programme is expected to be financed without the need to issue further share or loan capital.

Provided there is no unexpected change in the situation it is intended to raise the interim from 4 per cent. to 6 per cent., solely to provide a better balance between interim and final payments. The dividend for the year ended September 30, 1959, is effectively raised by 2 per cent. to 14 per cent. with a 10 per cent. final. Group net profits expanded to £4,521,390 (£3,334,062).

IRON AND STEEL TRADE

HOPES that the calamity of a rail strike will be averted have fluctuated during the week, but the steel industry and, indeed, all the heavy industries have been preparing for the worst. In other directions the outlook for steel is bright with promise. The reductions in the maximum home prices of various iron and steel products which became effective on Monday should further stimulate the rising demand for British steel. A good deal of the recent rise in output has gone into the stockpiles, but there is also a considerable expansion of demand for constructional material, and the British Iron and Steel Federation expects that exports, now running near an all-time record, may rise by a further 5 per cent. in the course of the current year.

Pig-iron

Since the big steel companies provide their own supplies, the reduction of 7s. 6d. per ton in the price of basic pig-iron is more or less a book entry. Hematite iron is 15s. a ton cheaper, but there has been no variation in the values of foundry grades. The Iron and Steel Board's announcement of these price changes is accompanied by explanatory notes in which reference is made to the use of a higher proportion of pig-iron in relation to scrap in steelmaking, and "as pig-iron is the more expensive material there has been a rise in production costs."

This rising trend in the consumption of basic pig-iron in the open hearths has long been foreseen simply because supplies of scrap are inelastic. It is still the cheaper material, but there is not enough of it; and willy nilly the expansion of pig-iron production must continue to keep pace with the progress of the steel industry.

Ferro-alloys

The demand for most items continues to be at a good level. Ferro-silicon is a well-supported feature. Both the low- and high-carbon grades of ferro-chrome are receiving reasonable attention, while ferro-manganese and silico manganese are quite active. The more specialized demand by certain consumers for supplies of ferro-sulphide and ferro-phosphorus is maintained. Ferro-titanium is fairly active and there is a good request for ferro-niobium.

Ferro-molybdenum and ferro-vanadium are moderately supported and there is a fair demand for ferro-tungsten. The call on silicon metal shows little change, while chromium metal receives steady attention.

Semi-finished Steel

Semi-finished steel, and re-rolled products which absorb the bulk of the output of semis, are both excluded from the official list of price changes. Re-rollers are handling a very considerable volume of orders and their principal worry is to obtain regular and ample deliveries of billets, etc., from the steel mills.

Billet mill capacity has been very largely increased, but so also is consumption on a rising scale, and imports of foreign semis have been reduced to almost negligible proportions.

Finished Steel

Instead of an increase of about 8s. per ton in the price of tinplate, which was due on April 1 following the recent advance in tin prices, slight price modifications in strip mill tinplate prices have been authorized. But the principal changes in the steel price structure, which apply to all current deliveries from Monday last, are reductions of 10s. per ton for steel plates and 20s. for heavy joists and sections.

Shipbuilders profess to be disappointed. A 10s. cut, they say, is not enough, but it will help towards a restoration of the competitive position. The bigger reductions in the maximum prices of heavy steel sections and joists is a well-timed move which should further stimulate the revival in a branch of the steel trade which has only recently shown distinct signs of recovery.

The broad effect of the reductions, which are limited to about 25 per cent. of the industry's total output, is that the average level of steel prices is down by 2½ to 3 per cent. These are the third cuts which have been authorized since March, 1958, and the result is that UK prices, according to the Iron and Steel Board, are now "substantially lower" than those ruling in the United States, and for corresponding products in open-hearth qualities are generally below those ruling on the Continent.

Power-Gas and Davy-United Merger Talks Continue

POSSIBLE merger of the Power-Gas Corporation, Limited, gas, chemical, petroleum, blast-furnace, and steelworks engineers, of Stockton-on-Tees, and Davy-United, Limited, manufacturers of plant for steelworks and heavy engineering, etc., of Sheffield, is still being discussed, it was announced on Thursday of last week. No conclusion has yet been reached and a further announcement will be made as soon as details are available.

Meanwhile, group trading profits for Power-Gas for the year to September 30, 1959, rose to £1,857,713 (£1,380,186) and the dividend is increased from 20 to 30 per cent. A final of 22½ per cent. makes 30 per cent. on the £1,400,000 capital, against the 20 per cent. dividend for 1957-58, which included a 5 per cent. special interim.

Orders booked totalled £7,750,000, compared with £9,250,000, but since the year-end orders have returned to a satisfactory level. After all charges the group net profit attributable to the company has increased from £532,107 to £780,810.

FINAL CONTRACT for the building of a steelworks in Spain has been signed between the Altos Hornos de Vizcaya concern, of Spain, and a German-Austrian consortium led by the Krupp concern and the Austrian State-owned VOEST company.

Coalfield News

Subsidence Hastens Notts Railway Closure

EFFECTS of mining subsidence in the railway tunnel at Mapperley (Notts) have hastened the decision to close the line which runs through it. Two stations, Daybrook to the west of the tunnel, and Gedling and Carlton to the east, will be put out of business by the closure at the end of March. The heavy coal traffic using this part of the old Great Northern line between the Erewash valley and Colwick marshalling yard will be routed through Victoria station, Nottingham.

The news was revealed to the Transport Users' Consultative Committee for the East Midlands at a meeting last week. Mr. A. J. Johnson, commercial officer for the London Midland Region of British Railways, told members: "It would be wrong to suppose that this line has been closed as a *fait accompli*. Earlier, we had thought we would be able to run passenger trains through the tunnel for another six months—but not freight trains. Railway engineers, after inspecting the tunnel, have discovered that the subsidence has even further rapidly deteriorated, so we have come to this decision."

A statement by the NCB said: "Pillars of coal were left to support the Mapperley tunnel after negotiations between the former coalowners and the railway company 20 years ago. We have never been involved directly. The railways paid to have the pillars left, and they remain untouched."

THE LONGEST-SERVING mine worker at Woolley Colliery (Yorks), Mr. G. Darker, has retired at the age of 85 after 53 years' mining service.

COAL SHIPMENTS from the river Wear during 1959 totalled 2,197,863 tons, a decrease of 120,170 tons on 1958. There was an increase of 68,935 tons in foreign shipments, but a decrease of 189,105 tons in coastwise shipments.

WORK FOR UNEMPLOYED miners from Blackhill Colliery, Berwick, will be provided by the Elsdon Colliery Company, Limited, which has been given permission to start pumping operations in the Allerdean Drift, last worked 30 years ago.

CLOSURE OF Dinnington Colliery (Northumberland) on February 27 will mean redundancy for about 200 miners. The remainder of the 316 miners employed there have been found work at other pits and on salvage operations at Dinnington.

THE 750 MINERS at Nantgarw Colliery (Glam)—the "showpiece" pit of Wales—ended their 11-day strike on Wednesday so that negotiations could be opened. The men were warned that a continuation of their strike, over wet conditions in the Little Rock Seam, might imperil the future of the pit, and the Coal Board refused to discuss grievances while the men were idle.

MEADOWS PIT, East Rainton (Co. Durham), is to be closed on March 25 and about 90 miners will be declared redundant. Of the 334 men employed there, 134 will be transferred to Houghton Colliery, 38 to Lambton "D" Pit, 18 to Lumley Sixth Pit, and 53 retained on salvage work. It was originally planned to close the pit at the end of January and it was stated that 182 men would become redundant. After further talks between the men's union and the NCB this figure has been halved.

COAL AND COKE SHIPMENTS from the South Wales ports last week dropped to 56,047 tons, a reduction of 24,564 on the high total of the previous week. Last week's figure was, however, 6,453 tons higher than the figure in the corresponding week last year. Tonnages shipped from the various ports last week (with figures for the corresponding week of 1959 in brackets) were:—Newport, 9,060 (8,146); Cardiff, 9,990 (3,509); Penarth, 4,314 (6,361); Barry, 11,636 (14,365); Port Talbot, 1,498 (2,539); Swansea, 19,549 (14,674).

DURING THE FIRST FOUR WEEKS of 1960 output in the West Midlands Division of the NCB totalled just under 1,250,000 tons. This was 127,000 tons, or about 9 per cent., less than the output of the corresponding period last year. Output per manshift at the face was 89 cwt., a gain of more than 4 cwt. on last year's figure, and output per manshift for all colliery workers was 28 cwt., an improvement of a little under 1 cwt. The number of men on the books at January 30 was 49,173 (55,670 last year), and during the four-week period coal stocks were reduced by 68,000 tons to 3,198,000.

DROP IN THE NUMBER OF BOYS entering coal mining in Derbyshire has occurred against an industrial situation in which jobs were harder to get and against an increasing number of school-leavers, says the annual report of Derbyshire County Council Youth Employment Service. The report says that publicity given to the closure of pits, the retirement of older miners, and the stocking of unsold coal has deterred recruits. "It is known," the report goes on, "that some of those who have entered the industry have done so only because they have not been able to get other employment." During the year ended September 30, 1959, only 20 per cent. of boys leaving school entered the Derbyshire coal-mining industry. This represented a drop of 12 per cent. on 1956-57 and of 7 per cent. on 1957-58.

Steel, Peech & Tozer Staff Changes

THE following staff changes are announced by the Steel, Peech & Tozer branch of the United Steel Companies, Limited. From January 25, Mr. M. Thomas has been appointed assistant works manager (services) and Mr. E. Houghton has become assistant works manager (special duties). Mr. Houghton will be primarily concerned with manning problems arising from the conversion from open hearth to electric arc furnaces in the Templeborough melting shop.

From March 1, Mr. D. R. B. Burdass will become personal assistant to the general works manager. On the same date, Mr. D. Reilly, until recently with Guest, Keen & Nettlefolds, Limited, will join the company as cold rolling mill manager. He will be responsible in his new capacity to the works manager, Ickles, for both the existing and new cold rolling departments.

Mr. G. D. Jordan, who has been senior engineer in United Steel's department of operational research and cybernetics since its formation, will, from March 1, become Templeborough melting shop project secretary, responsible to the chief engineer. Mr. J. Hewitt, of the research and development department of United Steel, is appointed senior research metallurgist on the same date, responsible to Dr. B. B. Hundy, chief research metallurgist. Mr. J. Ravenscroft, at present with the British Iron and Steel Research Association, joins the company on March 1 as arc furnace research assistant, responsible to Mr. R. S. Howes, manager of the Rotherham melting shop.

Obituary

MR. T. C. JAMES

DEATH occurred at Cheltenham on Saturday of Mr. Thomas Claude James, chairman and joint managing director of the Wolverhampton Metal Company, Limited, which was founded as a private company by his father, Mr. Summerhill James, last century. He was 74. Mr. James was the last survivor of six brothers, who, at the end of the century, took charge of the company, which became limited in 1902.

Mr. James was also chairman and joint managing director of the James Bridge Copper Works, Limited, Walsall, Barton Williams & Company (Birmingham), Limited, and Hayes Metals (Gloucester), Limited. He was president of the Copper Refining Association, a past-president of the Brass and Bronze Ingot Manufacturers' Association, and a member of the Association of Light Alloy Refiners.

MR. J. O. CRABTREE

MR. JOHN OLDFIELD CRABTREE, who died on Thursday of last week at the age of 46, was a leading figure in the printing press industry. He joined his father's firm, R. W. Crabtree & Sons, Limited, Leeds, in 1932. After passing through all the departments of the works he spent some time in the drawing office before moving to the sales side of the business. He became a director in 1936.

He was recalled from military service in the last war to take charge of R. Hoe & Company, and later, R. Hoe & Crabtree, Limited. In 1948 he became vice-chairman of R. W. Crabtree & Sons, Limited. Mr. Crabtree remained with his father's firm until 1957, when he resigned to inaugurate a business, J. O. C. Engineers, Limited, building a different type of printing machine.

Mr. J. W. H. SIMPSON, secretary of the Stevens Screw Company, Limited, Wolverhampton, for 35 years, has died at the age of 74.

Mr. JOHN SMEDLEY, chief production engineer of the aero-engine division, of Rolls-Royce, Limited, Derby, died on Thursday of last week. He was 55.

Mr. FRANK BERNARD HOLBERRY, who has died at the age of 60, was assistant manager of the Llanelly Foundry & Engineering Company, Limited.

Mr. WILLIAM ROWNEY, senior partner of William Rowney & Son, brassfounders and engineers' furnishers, of Glasgow, has died at the age of 74.

The death occurred on February 3 of Mr. HARRY BRAY, principal of the firm of H. Bray & Sons, scrap metal merchants, of Holmfirth (Yorks). He was 77.

The death occurred on February 1 of Mr. STANLEY WHITAKER, formerly training and safety officer at Springwood Colliery, near Huddersfield. He was 63.

The death is announced of Mr. CHARLES TAYLOR, who for many years was an official of Grassmoor Colliery (Derbyshire), being a deputy, overman, and labour officer. For the past 10 years he had been training officer of Williamthorpe Colliery. He was 58.

Mr. FREDERICK PEEL, landsale depot manager for No. 2 (Doncaster) Area of the North-Eastern Divisional Coal Board for 10 years, collapsed and died soon after finishing a round of golf at Doncaster Golf Club. He was 57. Mr. Peel was previously connected with the former Doncaster Amalgamated Collieries, Limited.

Mr. THEODORE NICHOLSON, who has died in Hertfordshire at the age of 84, was manager of Thrislington Colliery and, later, Willington Colliery (Co. Durham). In 1909 he became the first manager of the new coke-oven and by-product plant at Brancepeth Colliery, a position he held until his retirement in 1932.

Mr. GEORGE NAISMITH FERGUSON, chairman and managing director of the Forth & Clyde Coal Company, Limited, died on Wednesday of last week. He had been in the coal trade for 55 years and had held the post as managing director of the company and its associates since 1935. He was a former chairman of the Scottish Small Mine Owners' Association.

The death has occurred of Mr. STEPHEN BRADLEY MARR, who rose from trapper boy to colliery manager in 52 years in the mining industry. Mr. Marr became manager of Dunston and Swalwell collieries (Co. Durham) in 1938 and later moved to Herrington Colliery, where he was manager for 16 years. In January, 1954, he went to South Hetton to take charge of sinking operations at a new mine there. Mr. Marr retired about five years ago.

State Steel Threat is not Dead, says S & L Chairman

WARNING that in spite of the rejection of steel nationalization at the General Election, its advocates had not accepted the verdict of the electorate was given in the annual statement made by Mr. A. G. Stewart, chairman of Stewarts and Lloyds, Limited, on Wednesday at the company's annual meeting. Mr. Stewart was among the leaders of the campaign against the renationalization of steel which he terms "an unjustified and ruinous doctrine."

Since last October the general opinion might be gaining ground that the threat of nationalization had gone for good and all, but whereas it was undecided whether steel renationalization should remain part of the Socialist programme and no definite decision might be taken for two or three years, he believed private enterprise should continue to be watchful. "If the threat should arise again private enterprise should react to it more quickly and more forcefully than it did to the recent threat," he maintains.

The company's iron and steel plants were working to full capacity, but so far as trade with the oil companies was concerned the position was not as satisfactory. Present indications were that the tonnage which the oil industry would take from the company during the current financial year would show a distinct improvement on the very low figures for 1959, but it would probably be some time before the demand, which the company previously indicated and for which it had provided specialized equipment, materialized.

The £19,000,000 outstanding capital expenditure schemes would be financed substantially out of retained profits and the use, from time to time, of bank facilities. "We intend, however," Mr. Stewart said, "at appropriate times to ask for the support of shareholders in the raising of additional money. There is no intention of any such approach at present."

The meeting approved the increase in the authorized capital from £40,000,000 to £60,000,000.

Personal

Institution of Electrical Engineers' Awards

IN recognition of his extensive contributions to the application of electrical science and engineering in the manufacture of electrical plant and equipment and to development and training within the industry, Col. B. H. LEESON has been elected an honorary member of the Institution of Electrical Engineers.

Until his retirement last July he was director of the British Electrical and Allied Manufacturers' Association. He is also a former chairman of the British National Committee of the International Electrotechnical Commission and a past president of IEE. Col. Leeson joined A. Reyrolle & Company, Limited, manufacturing electrical engineers, of Hebburn (Co. Durham), in 1919, and was appointed joint manager in 1937, a director in 1938, general manager in 1940 and managing director in 1945.

For his notable contributions in the development of electricity generation, particularly in Canada, Dr. RICHARD L. HEARN has also been made an honorary MIEE. He has been associated with many of the leading electrical generation projects in Canada and is a director of Atomic Energy of Canada, Limited, and of several other organizations.

Mr. ABNER GILBODY, assistant manager of Chanters Colliery, Atherton (Lancs), has retired after over 50 years in the mining industry. He had been at Chanters for the past three years.

Mr. J. E. BROWN, group surveyor at Newbiggin Colliery (Northumberland) for 14 years, has retired after 51 years in the coal-mining industry. He received a presentation from his colleagues.

Mr. A. E. STURDY, secretary of the Russo-British Chamber of Commerce for the past 25 years, has retired at his own request on reaching the age of 65. He is succeeded by Mr. H. E. S. HAYWARD, assistant secretary.

Mr. E. P. COLLINS, advertising manager of the Morgan Crucible Company, Limited, London, S.W.11, and its associate companies, has been elected hon. secretary of the Incorporated Advertising Managers' Association.

Prof. I. C. F. STATHAM has been elected an honorary Fellow of the Royal Institution of Chartered Surveyors. Since he retired in 1954 as Professor of Mining, University of Sheffield, he has been engaged as a consulting mining engineer.

The 38th award of the Faraday Medal has been made by the Institution of Electrical Engineers to the distinguished scientist Sir GEORGE THOMSON, FRS. He is this year's president of the British Association for the Advancement of Science.

Mr. C. R. WHEELER, chairman of the Guest Keen Iron & Steel Company, Limited, flew to New York on Wednesday. Mr. Wheeler, who is associated with many other companies, is president-elect of the British Iron and Steel Federation.

Because of continued ill-health, Mr. GEOFFREY G. HOARE intends to leave Birmingham in the spring and make his home near Painswick (Glos). He will, however, remain on the board of J. F. Ratcliff (Metals), Limited, Birmingham, with which he has been associated for 17 years.

A third generation of colliery engineers, Mr. FREDERICK BROOMHEAD, mechanical engineer of the 12 Doncaster district pits in the North-Eastern Divisional Coal Board's No. 2 Area, is retiring at the end of March. His grandfather, Mr. Robert Broomhead, was a colliery engineer in Derbyshire for many years, and his father, Mr. Thomas Broomhead, was engineer at Bullcroft Colliery, Doncaster, where he worked on the sinking of the pit shaft. Mr. Frederick Broomhead began his career with his father at Bullcroft.

Viscount CILCENNIN of HEREFORD, who is a director of the Bestwood Company, Limited, Silentbloc, Limited, and other companies, has been elected to the south-western district board of Martins Bank, Limited. Mr. J. B. WOODESON has been elected to the bank's north-eastern district board. He is chairman of Clarke, Chapman & Company, Limited, the Gateshead manufacturing marine and electrical engineers and boilermakers, of Clyde Crane & Booth, Limited, and of Moxey, Limited, conveying and elevating specialists, of Birmingham.

Mr. WILLIAM T. FODEN, superintendent of the Mines Rescue Station at Stoke-on-Trent (Staffs) since 1946, has retired. As a boy he started work at Victoria Colliery in 1908, but has been associated with mines rescue work since 1915—even during the first world war when serving with the Royal Engineers. He became a permanent member of the station staff in 1920 and has attended every major accident and the majority of the minor ones in the north Staffordshire coalfield. His successor is Mr. S. BLOOR, who has been superintendent of the Dudley rescue centre for the past eight years.

Leader of a small party of UK businessmen and industrialists which is going to Cairo on February 23 with the purpose of renewing trading contracts and of examining the prospects for increasing trade in both directions between the UK and the UAR is Mr. GEORGE NELSON, managing director of the English Electric Company, Limited. Other members include Mr. R. WONFOR, sales director of Vickers-Armstrongs, Limited. The party is going in response to an invitation from the UAR Government, under the auspices of the Advisory Council on Middle East Trade and the Federation of British Industries.

Mr. WILFRED DUNCAN BULLOWS, who joined Castings, Limited, Walsall, in 1926 as manager, is retiring from full-time service with the company at the end of next month. He was appointed a director in 1929, became chairman and joint managing director in 1933, and resigned from these offices at the beginning of this month. Mr. Bullows has entered into an agreement with the company under which he agrees to serve as part-time consultant director for a period of 11 years. Mr. JOHN FARRINGTON COOKE, who had been joint managing director with Mr. Bullows since he joined the company in 1933, is now the company's executive chairman.

Sir WALTER WORBOYS, who has resigned after holding office since 1953, is succeeded as chairman of the Council of Industrial Design by Mr. DUNCAN M. OPPENHEIM. The new chairman, who was knighted in the New Year Honours, is chairman of the British-American Tobacco Company, Limited. He has been chairman of the Royal College of Art since 1956. Among new members of the council appointed by the President of the Board of Trade are Mr. W. L. MATHER, a director of Mather & Platt, Limited, electrical and textile machinery engineers, etc., of Manchester, and Mr. T. G. COUGHTRIE, chairman and managing director of the Belmos Company, Limited, colliery and industrial switchgear manufacturers, of Bellshill (Lanarkshire).

Non-ferrous Metals

Settlement at Phelps Dodge Arizona Plant

UNDER a 29-month contract reached by the Phelps Dodge Corporation and negotiators for the Mine, Mill and Smelter Workers' Union at Douglas, Arizona, on Monday, pay and other benefits are increased by 33.2 cents an hour. The agreement is subject to ratification by the union membership. No indication was forthcoming, however, of any scheduled meeting between the company and the Steel Workers' Union, which has been striking at the Laurel Hill, New York, copper refinery of Phelps Dodge since August 1.

Demand for copper is good from the UK and from western Germany, and Eastern European countries are also coming into the market for their needs. Moreover, further import licences have been granted in Japan. Stocks of refined copper in LME warehouses are now down to only 3,822 tons—a fall of 550 tons on the week. Prices have fluctuated widely. In the US demand is good. Producers are still quoting 33 cents and custom smelters 35 cents a pound, although metal for immediate delivery commands something more than either of these quotations. On the other hand, the price of No. 2 scrap has moved down to 25¼ cents a pound, presaging lower prices for refined metal in the June quarter.

Tin is holding a steady course. Demand in Singapore is satisfactory and the same comment applies to London and to New York, where the price has advanced to around $1.01 a pound.

Lead and zinc markets have been under the spell of the communiqué issued at the end of last week to cover the Lead-Zinc Conference in Geneva. In general terms, the findings were that present production/consumption levels would result in a deficit this year of zinc of the order of 75,000 tons and a surplus of lead in the region of 100,000 tons. It was, therefore, agreed to raise the restrictions on the production of zinc immediately and to keep those on lead in force for a further nine months.

Important conditioning influences which came out of the conference were that the stocks of "Prime Western" zinc in the US were substantially above normal working levels and that the UK Government intends to dispose of its stockpile of zinc of 54,000 tonnes on the London market over the next four years.

Zinc, under these conditions in London, dropped a few points on the fears of increased production, the overhanging of the UK disposals, and the unusually high inventories of the metal in the United States. The US market is quiet, with the price unchanged at 13 cents a pound.

Lead, too, suffered on the Geneva communiqué, and with the prospect of a surplus of 100,000 tons this year, the London market is drifting downwards. The US market is also featureless and the quotation is unchanged at 12 cents a pound.

Official metal prices in London yesterday (Thursday) were:—COPPER, Standard: Prompt £269, forward £246. TIN, Standard: Prompt £792 10s., forward £790 10s. LEAD: Prompt £71 17s. 6d., forward £72 7s. 6d. ZINC: Prompt £89 15s., forward £90.

THOS. FIRTH & JOHN BROWN, LIMITED—Mr. T. H. Shaw, a local director of the company, has been elected a director.

AEI Sets Up Plant Applications Engineering Department

MANY years ago both the British Thomson-Houston Company, Limited, and the Metropolitan-Vickers Electrical Company, Limited, set up specialist departments to carry out the work of application engineering, including the co-ordinated selection of the electrical machines and design of the control schemes, needed in the successful design of many types of industrial electrical installation.

When the heavy plant division of Associated Electrical Industries, Limited, came into being on July 1, 1958, two such departments were formed in the division, one at Rugby and one at Manchester, from similar departments already existing in BTH and M-V. These two departments have both continued to deal with the application engineering of complete electric drives for rolling mills, mine-winders, etc.

Effective co-operation between these two departments within the division has now made it possible to unite them in a single new plant applications engineering department.

The manager of the new department, with headquarters at Rugby, is Mr. O. T. Evans, hitherto manager of the plant applications engineering department (Manchester), while Mr. W. Spence, until recently manager of plant applications engineering department (Rugby), is deputy manager (see "Appointments," p. 384). In addition, Mr. Spence now assumes special responsibility for directing the development of new schemes and control apparatus for the whole of the combined department, both at Rugby and at Manchester.

The manager is assisted by four engineers-in-charge, each of whom controls the activities in a specialized field both at Rugby and at Manchester. They are:—Mr. L. Abram (mining projects); Mr. P. E. Peck (metal industries projects); Mr. J. McTaggart (regulating systems and general projects), and Mr. H. Williams (control equipments). Mr. Peck and Mr. McTaggart are located at Rugby. Mr. Abram and Mr. Williams, being located at Manchester away from the headquarters of the department, have also the title of assistant manager on account of administrative duties which they discharge on behalf of the manager.

Thorncliffe Apprentices' Fourth Miniature Cupola

MADE by a team of six apprentices at the Thorncliffe Works of Newton, Chambers & Company, Limited, Sheffield, a miniature cupola is to be installed in new buildings at the Rotherham College of Technology during the course of the next few weeks. The cupola was made in the summer of 1958 and has been stored at Thorncliffe until the new buildings were ready to receive it.

The fourth of its kind, the cupola is similar to the one, also made by Thorncliffe apprentices, which is in use in the foundry department of the Newton, Chambers training centre. A third, made by Thorncliffe apprentices, is now in use at the North Lindsey Technical College, Scunthorpe, and another was built for training purposes by a firm which asked Newton, Chambers to supply the plans.

The Rotherham cupola was constructed under the supervision of Mr. H. Currie, constructional instructor at the training centre, in consultation with Mr. H. Pinder, foundry instructor.

Orders Placed

Refinery Equipment for Mexico

ORDERS from Petroleos Mexicanos, through Fluor Engineering & Construction Company, for fabricated refinery equipment of a value exceeding £250,000, have recently been received by Ashmore, Benson, Pease & Company, Limited (member of the Power-Gas group), Stockton-on-Tees.

The equipment, which is for the Minatitlan refinery, near Vera Cruz, Mexico, includes over 70 heat exchangers and two large vessels. The vessels are 12 ft. diameter and 214 ft. long. Due to transport considerations each vessel is to be despatched from the company's South Works at Stockton in four sections, one vessel being finally shipped in sections, while the sections of the other will be welded on the dockside at Birkenhead prior to shipment in one piece.

WORTH ABOUT £300,000, an order for heavy duty cranes for the new Llanwern steelworks of Richard Thomas & Baldwins, Limited, has been awarded to Craven Bros., Crane Division, Limited, Loughborough, a subsidiary of Herbert Morris, Limited. The order, the biggest ever secured by the company, will not be completed until next year.

A HIGH-SPEED cut up line has been ordered by the Steel Company of Wales, Limited, from the Head Wrightson Machine Company, Limited, Middlesbrough. The order is worth about £233,000. The line is for the Steel Company of Wales's Abbey Works at Port Talbot and is part of the new development programme designed to increase the output of steel sheets.

CONTRACT WORTH $4,000,000 (£1,333,000) to build a turbine generator for a nuclear power plant to be installed near Kincardine, Ontario, has been awarded by the Crown Company Atomic Energy of Canada to Associated Electrical Industries (Canada), Limited, a subsidiary of Associated Electrical Industries, Limited. Most of the work will be done in Britain.

ORDERS FOR A twin-screw diesel vessel has been placed with Fleming & Ferguson, Limited, Paisley, by the British Transport Commission. It is to be ready in 15 months' time and is required initially for dredging the entrance to Hull docks. The vessel will be 212 ft. long and have a hopper capacity of 1,600 cub. yds. and a speed of nine knots. This is the third dredger order the company has secured in eight months.

AN ORDER WORTH £18,000 for signal generators has been received from the Ministry of Aviation by Avo, Limited, of London, S.W.1, a company in the Metal Industries group. Purpose of the generators is to align, test, and adjust narrow-band radio-communication receivers. Taylor Electrical Instruments, Limited, Slough, another company in the group, has received an order from the GPO for 500 multi-range meters valued at more than £5,000.

THE LARGEST single order for a complete newspaper printing plant ever placed from one newspaper office has been received by R. W. Crabtree & Sons, Limited, Leeds. The order, worth nearly £2,000,000, comes from the Birmingham Post & Mail, Limited, and is for 12 five-unit newspaper presses with automatic high-speed folders and non-stop late news devices. Each press will be fitted with facilities for four-colour printing. Installation is due to begin in two and a half years' time and be completed in four and a half years.

Board Changes

STORMONT, ARCHER, LIMITED—Mr. G. H. Macintosh, sales manager, has been elected a director.

S. E. OPPERMAN, LIMITED—Mr. A. J. Heasman, secretary of the company, has been appointed a director. Mr. H. T. Halliday has resigned from the board.

STEEL FABRICATORS (CARDIFF), LIMITED—Mr. E. T. Hardy has been elected to the board of the company, which is a subsidiary of Adamant & Western Engineering, Limited.

SHEPCOTE LANE ROLLING MILLS, LIMITED—Mr. J. R. Edwards, works superintendent and a special director, has been appointed a director of the company. Mr. F. Brown, chief engineer, has been appointed a special director.

JOHN DALE, LIMITED—Mr. Norman Draycott has been appointed a director. Mr. B. L. Page has relinquished his executive appointment with the company and has retired from the boards of John Dale and its subsidiaries.

TAYLOR BROS. & COMPANY, LIMITED—Mr. A. Y. Johnson, who joined the company as an apprentice in 1925, has been appointed a director. In 1936, Mr. Johnson became manager of the wheel department and in 1949 he was also appointed manager of the axle department.

WEYBURN ENGINEERING COMPANY, LIMITED—Mr. H. Gordon, who retired as chairman of the company, has been succeeded by Lt.-Col. P. H. Bentley. Mr. Gordon had previously retired from the position of managing director and Mr. J. T. W. Scruby and Mr. H. R. Coverley have been appointed joint managing directors.

Mr. R. N. Millar to Head GEC Engineering Group

MR. R. N. MILLAR, a director of the General Electric Company, Limited, has been appointed managing director of the company's engineering group, which has its main works at Erith (Kent) and Witton, Birmingham. He will have overall responsibility for the company's whole activities in the heavy electrical, mechanical, and nuclear engineering fields.

Mr. Millar was educated at Marlborough College, and after serving an engineering apprenticeship at the Fraser & Chalmers Engineering Works of the GEC, he went to Emmanuel College, Cambridge. After the war, he became an assistant mechanical engineer to the British General Electric Company in South Africa. In 1952 he was appointed chief mechanical engineer to the British General Electric Company, in Sydney.

Two years later, Mr. Millar was recalled to England to take charge of the company's atomic energy developments and became manager of the GEC-Simon-Carves Atomic Energy Group. He was appointed general manager of Fraser & Chalmers Engineering Works in 1958, and a year later became a director of the GEC.

A SHORT WORKING WEEK was introduced this week at the Stockton-on-Tees pipeworks of the South Durham Steel & Iron Company, Limited. A three-shift week is being worked because of the comparatively low number of contracts in the order-book.

Pit Contraband is Put on Show

A HAUL of a large number of cigarettes and matches, found underground during a recent snap search at Michael Colliery, East Wemyss (Fife), has been put on display in a window of the colliery canteen as a warning to the 2,500 miners there. It is believed that the contraband was dumped by men who had advance knowledge of the search. Michael Colliery is the largest pit in Scotland and has been a safety-lamp pit since 1952.

The discovery has provoked sharp comments from officials of both the National Coal Board and the National Union of Mineworkers. Mr. T. D. M. Scrimgeour, Area general manager of the East Fife Area of the Scottish Divisional Coal Board, said: "The fact that men breaking contraband regulations are subject not only to the penalties of the law but also to instant dismissal from the industry is well known. After all the warnings given and action taken, we are at a loss to understand how any sensible man can be guilty of such conduct, dangerous both to himself and other people employed in the mine. We can only regard it as rank stupidity."

The NUM delegate at the colliery, Mr. Max Meharry, commented: "We have always supported the management in any steps they took in their attempt to cut down the carrying of contraband underground. The stiffer court sentences and the fact that the union have agreed with the board that men found guilty of carrying contraband will be barred from the industry for life have certainly helped towards stamping out this evil practice. But if it is to be stamped out completely there must be self-discipline. Any man who sees a neighbour smoking should report it at once to the union."

Mr. Meharry added that steps had been taken to prevent prior warnings of snap searches. "As union officials we were really perturbed about the discovery of this contraband. We will be holding pithead meetings on the question covering all shifts," he declared.

Another union official, Mr. John McArthur, Fife district secretary, said: "I cannot think of anything more dangerous and more silly. Some men think that because it is a pit where gas probably has not been known, there is no danger. Unfortunately, we have had some serious explosions in pits where gas was not previously expected, and there is no telling when it might occur."

A number of men from Michael Colliery have been fined or sent to prison for contraband offences in recent years.

£750,000 *Paid for British Columbia Coal Deposits*

A COAL deposit at Hat Creek, about 180 miles from Vancouver, has been bought by the British Columbia Electric Company for $2,000,000 (about £750,000). The company is believed to be planning to build a generating station with a capacity of 2,600,000 h.p.

Recent surveys of the deposit show it to be much larger than originally thought. Mining engineers calculate that there are 340,000,000 tons of coal in a single square mile with probable reserves of as much again. Until now, the emphasis in British Columbia has been on hydro-electric power.

Scottish Miners Criticize Oil-heating Moves

EDINBURGH Corporation and Midlothian County Council were both criticized by the executive committee of the Scottish Area of the National Union of Mineworkers on Monday for installing oil-fired apparatus in certain buildings. After the meeting, Mr. Abe Moffat, president of the Scottish Area, said that the local authorities concerned would be written to and that councillors in mining villages and towns would be urged to fight the change-to-oil policy.

Members complained about a change from coal to oil in the new development of Edinburgh's lighting and cleansing department and a decision in favour of oil heating in a new school at Gorebridge, Midlothian.

Mr. G. P. Wands, deputy county clerk of Midlothian County Council, said later that plans for the school were completed two years ago and that if a change were to be made to a solid-fuel system there would be extra expenditure of £3,000 and a delay of two months. Mr. A. Steele, Edinburgh city architect, said that the corporation used all types of energy for heating. In a year, the corporation used about 31,500 tons of solid fuel.

NCB "No Houses" Plea Fails

A REQUEST by the National Coal Board that building should be prevented on the outskirts of Bearsden and Milngavie (Dumbartonshire) in order to allow a new colliery to be sunk some time after 1965 has been refused by Mr. John Maclay, Secretary of State for Scotland. This means that the Secretary of State has also rejected the board's appeal against the decision by Dumbarton County Council refusing an application for permission to develop the colliery on this site.

In his letter to the board, the Secretary of State said that the land contained 200 acres suitable for housing with room for 1,500 houses. If, as the board thought possible, the colliery were not brought into production until 1980 and if another 20 years were needed to extract the coal, this building land would be sterilized until the year 2,000. This was not justifiable.

The boundaries of the proposed collieries included the Summerston area of Glasgow, but the Secretary of State's decision refers only to the Dumbartonshire site.

Recent Wills

HOUGH, HENRY, of Willenhall, lock manufacturer ... £16,356

RICKMAN, FREDERICK, of Lymington (Hants), former coal merchant £12,233

ROTHBARTH, HERBERT, a director of the Amalgamated Limestone Corporation, Limited, and other companies £573,933

RAVENHILL, H. S., of Cleethorpe (Lincs), former managing director of the Great Grimsby Coal, Salt & Tanning Company, Limited £20,879

TAYLOR, THOMAS, who, when he retired at the end of May, 1957, had been associated with coke ovens for half a century and had been at the NCB's coking plant at Thornhill, near Dewsbury (Yorks), for 46 years, 31 of them as coke-oven manager ... £6,429

WEST, SIR FREDERICK J., late chairman of West's Gas Improvement Company, Limited, and West's Piling & Construction Company, Limited, and a director of the Derbyshire Silica Firebrick Company, Limited, and a former chairman of the Manchester Ship Canal Company, president of the Institution of Gas Engineers, 1941-42, chairman of the Society of British Gas Industries, 1910-11, and its president, 1946-47 ... ... £52,328

Appointments

In Charge of AEI's New Department

MR. O. T. EVANS, whose appointment as manager of the new plant applications engineering department (see p. 381) of the heavy plant division of Associated Electrical Industries, Limited, is announced, gained early experience in the South Wales coalfield, after which he went to the Metropolitan-Vickers Electrical Company, Limited, Trafford Park, as a school apprentice in 1943 and later spent a year as a mining trainee before joining the company's mining division.

From 1953 he was responsible for mining development projects and was appointed assistant chief engineer (mining), electrical general engineering department, in 1956, being promoted chief engineer of that department in the following year. Following upon the reorganization of AEI the title was changed to manager, plant applications engineering department (Manchester).

Mr. W. SPENCE, appointed deputy manager of the new department, joined the British Thomson-Houston Company, Limited, as a student apprentice in 1937, having previously spent two periods with the company as a vacation apprentice. His service in the last war included a period, as a captain in the REME, as lecturer in electrical engineering and fire control instruments at the Military College of Science. Mr. Spence rejoined BTH in 1946 on the industrial engineering staff, working on rolling mill schemes and studying amplidyne applications in industry.

In 1947 he was awarded a BTH Fellowship which enabled him to spend a year in the United States with the General Electric Company. He worked on high-speed tandem cold strip mills and electronic sectional paper-machine drives. Mr. Spence rejoined the industrial engineering department in November, 1948, and was appointed section leader of the electrical development section. Three years later he became assistant manager of the department and was appointed manager at the beginning of 1957.

Mr. J. TAYLOR has been appointed training officer at Nook Colliery, Tyldesley (Lancs), in succession to Mr. E. Mann, who has retired.

Mr. J. L. HARTLEY, assistant Area general manager of the Wigan Area of the North-Western Divisional Coal Board, has been appointed divisional deputy industrial relations director.

Mr. B. WHITE has been appointed head of section "B" of the North-Eastern Divisional Coal Board staff department. In the same division, Mr. S. REDGATE has been appointed marketing manager of No. 4 (Carlton) Area.

Sir WALTER J. WORBOYS, a director of Imperial Chemical Industries, Limited, has been appointed a director of the Associated Portland Cement Manufacturers, Limited, and British Portland Cement Manufacturers, Limited.

Mr. W. H. HAUGH has been appointed manager of the Glasgow branch office of Renold Chains, Limited, at 26, Blythswood Square. He succeeds Mr. S. H. FOSTER, who has taken up other duties at Renold House, Manchester.

Mr. B. L. MOULTRIE has been appointed general manager of the railway traction department of Rolls-Royce, Limited, in succession to Lt.-Col. L. F. R. FELL, who has been appointed a consultant to the company on railway matters.

Mr. JOHN OADES, whose appointment is announced as lecturer in charge of metallurgy at Stafford College of Technology, is only 27 years of age. He graduated at Sheffield University and has been engaged as a research scientist at AEI, Harlow.

Mr. ANTHONY CAWLEY, who has taken up an appointment as chief of services at the Derby works of Qualcast, Limited, light repetition founders, etc., was previously electrical engineer of Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield.

Mr. WILLIAM A. STARKIE, for the past four years electrical engineer at Merrylees drift mine, near Coalville (Leics), has been appointed mechanical and electrical engineer in charge of four collieries near Calcutta. Mr. Starkie, who is 31, has been in the mining industry all his working life.

Mr. COLIN SMETTEM, who has been appointed commercial manager of the North Western Gas Board's largest operating unit, the Mersey group, will take over his new duties on May 1 in succession to Mr. Frank Fisher. Mr. Smettem's new post is the first in the gas industry of the north-west to embrace responsibility for all group sales of gas (domestic, commercial, and industrial), all coke sales, appliance sales, and all supporting technical services, including the industrial gas development centre at Liverpool.

Mr. J. N. M. LEGATE has been appointed manager of the control gear enginering department (Manchester) of Associated Electrical Industries, Limited. He joined the Metropolitan-Vickers Electrical Company, now AEI (Manchester), Limited, in 1931 as a student apprentice. From 1947 he specialized in electronic control and from 1953 to 1955 he assisted the sales manager of the industrial control department. In 1955 Mr. Legate became assistant chief engineer of this department, a position he held until his present appointment. Mr. C. T. SCARF, who has been appointed chief control gear development engineer of the motor and control gear division, joined the former Metropolitan-Vickers Company first as a draughtsman and then as an engineer in the industrial control department. In 1928, he left to become chief engineer of the industrial control department of the English Electric Company, Limited. Six years later he rejoined Metropolitan-Vickers as assistant chief engineer in the industrial control department, but left the company again in 1942 to become chief engineer to a firm of control gear specialists in Wolverhampton. Mr. Scarf returned to Metropolitan-Vickers in 1951 as chief engineer, industrial control department.

BILL TO AUTHORIZE LOANS TO STEEL COMPANIES

BILL to authorize the Treasury to make loans to Colvilles, Limited, and Richard Thomas & Baldwins, Limited, for the building of strip mills at Ravenscraig and Llanwern, Newport, respectively, is to be published early next week. The Ravenscraig project is estimated to cost £50,000,000 and the Bill is likely to authorize the borrowing of the whole of this sum.

Similarly, the cost of the Llanwern project—£60,000,000—is likely to be provided for in the Bill and the date of repayment is expected to be October 1, 1971, compared with October 1, 1978, in the case of Colvilles.

Though legislation in the immediate future to denationalize those companies still controlled by the Iron and Steel Holdings and Realization Agency is discounted the introduction of the Bill will give an opportunity for Conservative backbenchers to ventilate their desire for early denationalization.

Atlas Copco Equipment for

Mining & Tunnelling

Tiger Rock Drill

Atlas Copco make a complete range of pneumatic drills for mining and tunnelling under all kinds of conditions. In addition there is a series of loaders (both rail-mounted and with pneumatic tyres) for service in the same industries. A few examples are shown below; there are many more of course, and your nearest Atlas Copco branch office will be happy to give you full details.

TIGER Rock Drill. The Tiger is a powerful new drill with a high penetration speed, ideal for drifting, tunnelling and general stoping operations. The Tiger is fitted with an integral pusher leg incorporating a retractable piston rod which extends from the bottom of the feed leg, all controls for both pusher and rock drill are conveniently centred in the back head of the drill.

T2G Autoloader

T2G Autoloader. The T2G Autoloader enables the complete work-cycle including mucking, carrying, dumping to be carried out by one man. The autoloader is suitable for cut-and-fill-stoping in ore mines, drifting in collieries and for loading operations at the surface. Capacity is high and as the T2G is fitted with pneumatic tyres it can operate over a far greater area than any track-bound loader.

ER6 Stationary Compressor. Two-stage, twin-cylinder, double-acting, designed for reliable 3-shift operation. With a delivery of 1,075 c.f.m. at 100 p.s.i. it has a lower power consumption than other comparable compressors. A new type of intercooler keeps the consumption of cooling water down to 440 imperial gallons an hour compared with 1500-1800 gallons required by similar machines. The ER6 is compact. It can be installed in little over half the space required for any other machine with a comparable delivery.

ER6 Stationary Compressor

Sandvik Coromant Drill Steels. Sandvik Coromant drill steels have been developed in close co-operation with Atlas Copco. This combination of Atlas Copco Rock Drills and Sandvik Coromant Drill Steels is currently drilling more than 1,300 million feet a year. The Sandvik Coromant range includes integral steels (hexagon or flexible), detachable bits, extension equipment and stone-working tools. Full details are available from Atlas Copco offices.

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African Notes

Ghana to Develop Aluminium Resources

DISCUSSIONS between Dr. Nkrumah, Prime Minister of Ghana, and representatives of a number of aluminium companies have resulted in the formation of a new company, to be known as Volta Aluminium Company, which will be established in Accra. Dr. Nkrumah has stated that during the next six or eight months he hoped negotiations with the new company would lead to the setting up of a smelter at Tema for treating bauxite.

Apart from preliminary works connected with the Volta dam project, the Ghana Government has asked Kaiser Engineers & Constructors to carry out additional work at the dam site. This will be completed in the spring of next year. Kaiser will also complete all engineering design work of dam and tender documents so that the Government can act "as necessary" by September 1, 1961.

The board of the Rhodesian Iron & Steel Company, Limited, in which the Southern Rhodesian Government has a large interest, announces that it will close down its Bulawayo works in stages during the course of the next few months. Because of obsolete and worn-out plant the works has become costly to operate.

Zinc production at the Rhodesia Broken Hill mine, Northern Rhodesia, totalled 7,670 long tons during the fourth quarter last year. Lead production amounted to 3,600 tons. Output for the year was 29,895 long tons of zinc and 14,400 long tons of lead, compared with 30,250 tons and 12,675 tons, respectively, in 1958.

Because of the improved rail truck position South African Railways can now serve the country's coal needs, Mr. J. J. van Rooyen, Railways Road Competition Officer, told the Road Transportation Board recently. He was representing the railways when 190 applications from Reef cartage contractors sought exemption to carry coal from the Witbank area to the Reef and Johannesburg.

The board has announced that in certain instances it would allow contractors to continue haulage operations until June 30. If, by then, the board decides not to extend the exemptions, all coal-carrying vehicles will disappear from the roads and the railways will handle all the traffic.

Technical Training Week Plans for 1961

COMMONWEALTH Technical Training Week will be held in the United Kingdom from May 29 to June 4, 1961. It is hoped that a similar week will be held in other parts of the Commonwealth at the same time. Object of the week is to stimulate awareness of the responsibility of the community towards young people starting work and to stress the importance of induction and training schemes. The City and Guilds of London Institute, of which the Duke of Edinburgh is president, has undertaken the central administrative responsibility, but direct organization in the UK will be in the hands of local authorities.

The organizers have written to local authorities asking them to consider whether they wish to take part and to decide the most suitable ways of running the week. Suggestions include church services, career and work exhibitions, open days, and sports and social functions.

Ore Chartering

MARKETS generally are holding, and although from certain areas there are variations in freight rate, it cannot be said that owners are pressing tonnage on the market.

As far as the North African coast is concerned, there is a good miscellaneous inquiry, which includes several cargoes from Spain, and in the ore section Benisaf/Ymuiden or Amsterdam paid 24s. 6d. for 8,000 tons, February, similar rate to 4,000 tons, February/March, and Hornillo to same destination paid 25s. for 6,000 tons, February. La Goulette/Calais fixed 5,000 tons for February 10-18 at 25s. 6d., and a small cargo of zinc ore for prompt loading obtained 31s., f.i.o., Carthagena/Rotterdam. Some small activity was recently noticed from North Spain, covering the fixtures of two vessels from Pasajes to the Tees for February and February/March at 30s. and Bilbao/Tees for second half February also paid this rate for about 3,600 tons residues. Coasting size secured 33s. Bilbao/Goole on gross terms.

From West Africa, Takoradi/Boulogne fixed 7,500 tons manganese, February/March, at 40s. 6d., but the bauxite market from Takoradi appears to be quiet, with no interest for this month's loading. Konakri ore to Bremen paid the high rate of 34s., f.i.o., for 10,000 tons and 9,500 tons Konakri/Hamburg 34s. 6d., also f.i.o. terms.

There is only a moderate inquiry for tonnage to load pyrites, but recent fixtures include Huelva/Ipswich for February/March at 37s. 6d. for 2,400 tons, and Huelva/Drogheda conceded 50s. for 1,200 tons, February, and 1,700 tons to Galway prompt at 51s. 3d. Morphou Bay to the Mersey took 9,500 tons for March loading at 40s.

In the phosphate section Casablanca/Immingham recently repeated 29s. for 8,000 tons prompt, and paid 34s. for 5,500 tons to Billingham. Tampa phosphate to Portishead and Garston arranged 5,500 tons for February at 52s. 6d. and, incidentally, paid $5.60, f.i.o., to Catania and Crotone, basis 9,500 tons, end February. Sulphur has been fixed from Galveston or Port Sulphur to east coast UK at 52s. 6d. for 11,500 tons, February shipment.

Unemployment Fear for 2,300 Miners

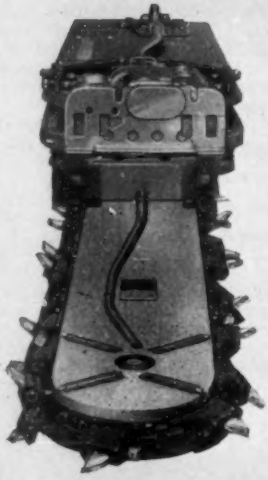
ALL pits in the Forest of Dean may be closed by 1965, said Mr. Charles Loughlin, Labour MP for Gloucestershire West, at a recent delegate conference called by Gloucester Trades Council. He said this would mean a further 2,300 miners without jobs. "At the moment," Mr. Loughlin went on, "we have some 700 people who travel 28 miles to work each day. It seems to me that unless some very determined action on the part of the present Government is taken then the Forest of Dean unemployment figures in five years will be fantastically high."

Mr. Will Paynter, general secretary of the National Union of Mineworkers, said the Forest of Dean problem was part of the general problem facing the mining community because of the fall in the demand and production of coal.

Delegates unanimously passed a resolution recognizing the urgent need for new industries and welcoming the representations being made to the Board of Trade for assistance. Maximum support was also urged from other North Gloucestershire MPs.

AIDS Muschamp to POWER LOADING

and Production of Large Coal



Muschamp Mushroom Jibs for coal Preparation. Production of large coal without explosives. Coal can be loaded by the use of specially designed flights.

Muschamp Double Jibs. Designed for use with coal cutters mounted on armoured conveyors.

Muschamp Whale Jibs fitted to power loaders suppress dust at the pick point and improve working conditions.

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News in Brief

LAST YEAR'S raw steel production in Rumania is stated to have been 52 per cent. more than that for 1958. General industrial production during the year rose by 11.1 per cent.

THE 18,000-ton d.w. Cardiff oil tanker Llandaff, now lying in the Tyne at Wallsend, is to be converted into a 23,000-ton d.w. Great Lakes ore carrier by the Island Shipping Company, Hamilton, Bermuda.

WASHINGTON REPORTS that world steel output rose by 10 per cent. to a record 318,000,000 tons last year. New records were established in Canada, Japan, the USSR, West Germany, France, and the Benelux countries.

DURING THE FOUR WEEKS ended January 16, the amount of steel carried by rail from the principal steelworks totalled 733,000 tons—an increase of 206,000 tons, or about 39 per cent., compared with the same period a year ago.

AS A RESULT OF the closure by George Wilson Gas Meters, Limited, of its No. 2 factory on the Bede trading estate, Jarrow-on-Tyne, between 30 and 40 employees have been given notice. The factory produced oil convector heaters.

AFTER EIGHT WEEKS, 600 men employed by John Brown Land Boilers, Limited, Clydebank, returned to work on Monday. The stoppage occurred when a shop steward was dismissed for boiling a can of tea outside the official tea break. The steward is not to be reinstated.

THE US FIRMS of Peabody Coal Company and Curtiss-Wright Corporation have founded a joint subsidiary—the Peabody-Wright Corporation—to produce a number of coal-tar products including a new tar developed by Curtiss-Wright for road and runway building.

STRIKE OF 800 WORKERS at the Smethwick factory of Henry Hope & Sons, Limited, makers of metal window frames, ended on Tuesday for talks to take place between the management and union officials. At the firm's Wednesbury factory, 200 men, who had been out in sympathy, also returned.

MINING AREAS where the contraction of the coal industry is likely to increase unemployment are included in the first Board of Trade list of places (published on Tuesday) which will be eligible for the new forms of Government assistance under the Local Employment Bill when it becomes law.

PRODUCTION LAST YEAR of the Norwegian State-owned iron and steel works of Norsk Jernverk was about 25 per cent. above the 1958 level. Compared with the previous year, 1959 production was up by 35 per cent. for pig-iron, 16 per cent. for raw steel, and 40 per cent. for sheet iron rolled products.

EUROPEAN COURT OF JUSTICE is to give a decision today (Friday) on the claim against the High Authority of the ECSC by three Ruhr coal-marketing companies, Geitling, Mausegatt, and Präsident, concerning the organization of the companies and the sending of High Authority officials to the Ruhr in a control capacity.

WEST GERMAN COMPANY set up to study pipelines for coal has announced that after years of experiment it is now in a position to plan definite projects. Interested in the company are the steel company, Phœnix-Rheinrohr, AG, the gas company, Ruhrgas, AG, and the gas and water concern, Thyssen'sche Gas- und Wasserwerk, GmbH.

THE RATE OF DRAWBACK of import duty on specified descriptions of imported aluminium foil used in the manufacture of certain exported metallic yarn is reduced by the Import Duty Drawbacks (No. 1) Order, 1960, made by the Treasury. The Order also describes more appropriately both the imported materials and the exported goods.

IN THE PAST MONTH West German steel production has continued to expand—to 2,770,000 metric tons, compared with 2,550,000 tons in December. Pig-iron production fell to 2,090,000 (2,520,000) tons. In spite of a greater number of working days hard coal output was, at 12,280,000 tons, 20,000 tons down on the December figure.

ONE OF EUROPE'S leading producers of fine plate, the West German steel concern Hüttenwerke Siegerland, AG, has declared a 10 (9) per cent. dividend for the financial year 1958-59 on its capital of just under £4,000,000. The company's main shareholders are the Dortmund-Hörder Hüttenunion, AG, and the August Thyssen-Hütte, AG.

MAINLY DUE to the demand for large-diameter welded tubes needed for the mineral oil and natural gas pipelines of the Sahara projects French steel tube production last year reached 1,060,000 metric tons, some 15 per cent. higher than the 1958 total. Exports last year, at 282,000 tons, represented 33 per cent. of production and topped the 1955 record.

IRON-ORE WORKINGS in the Allendale area of Northumberland are being offered for sale by Consolidated Goldfields of South Africa, Limited, which has been working iron ore there since 1955. The manager, Mr. A. Treloar, said the project was being abandoned because the undertaking was not big enough for the company. Two other firms are reported to be interested in the sale.

Nickel Consumption in 1959

FREE world consumption of nickel in 1959 exceeded 400,000,000 lb., or about 25 per cent. above the 1958 figure, states Dr. John F. Thompson, chairman of the International Nickel Company of Canada, Limited, in a review of the industry. Despite a substantial rise in consumption and the uncertainties in Cuba, he believes supplies will continue to be ample to meet demand.

In 1959 producers reached an anual capacity of 550,000,000 lb. and present development programmes are likely to increase this by a further 100,000,000 lb., or 18 per cent. It is estimated that three quarters of the increase will come from Inco's new mining project at Thompson, Manitoba.

Accounting for over 70 per cent. of supplies to the free world market, Canada continues to be by far the largest supplier to the US, the UK, and other users.

The directors of International Nickel have raised the quarterly dividend on the common shares to 75 cents a share in US currency, payable March 21 to shareholders on record on February 23. Previous quarterly dividend payments have been at the rate of 65 cents per share, unchanged since September, 1955.

The directors also recommend that the company's shares be split on a two-for-one basis and they announced that upon this action being taken by the shareholders, it was expected that the new shares would carry a quarterly dividend of 37½ cents per share assuming continuation of the current outlook. The expected quarterly dividend on the new shares would total $1.50 a year, equivalent to $3.00 a share on the present shares.

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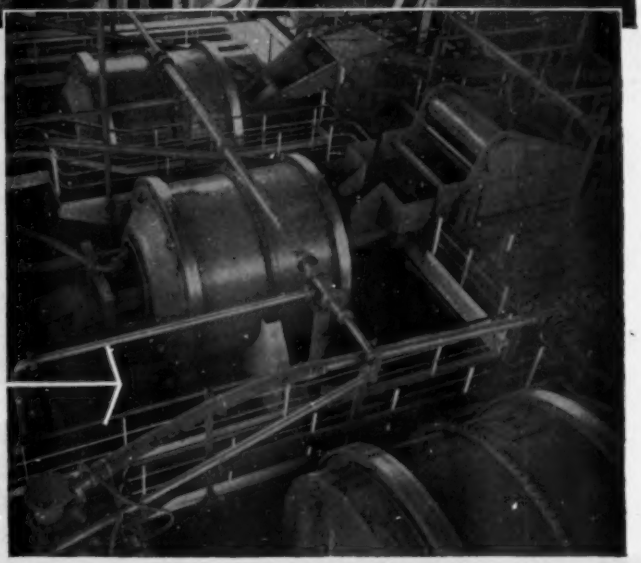

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42-hour Week Offer to Shipyard Men

SHIPBUILDING employers on Monday offered the unions a working week reduced from 44 to 42 hours. Mr. G. H. R. Towers, president of the Shipbuilding Employers' Federation, described the offer as "a practical gesture of goodwill" bearing in mind the repeated statements of confederation spokesmen that a reduction would not involve loss of production. "We have told you repeatedly of our concern at the time lost in the industry through unconstitutional action on the part of some of your members, and it is in the hope that we might avoid much of this lost time and the consequential disruption of planned production that we have sought your co-operation so often in the past," he went on.

Mr. Towers said that productivity in the shipyards had not risen to anything like the expected extent in view of modernization. "We have never sought to deny that many of your members have co-operated with us in the introduction of new techniques and methods. You consistently refuse, however, to recognize the justice of our complaint that there are too many cases where the introduction of new machines meets with resistance on the part of some of your members, either on the question of the manning, or the wages to be paid to the men operating them.

"That there should be some difference of opinion is to be expected. We do, however, think that any difficulties that arise ought to be settled by the process of negotiation through the industry procedure and not, as so often happens, by threats of strike action, bans on overtime, and the like," he said.

Rescue Brigade Competition in Edinburgh

RESCUE brigade competition to be held at the Central Mine Rescue Station, Heriot-Watt College, Edinburgh, on February 27 will commence at 9 a.m. Presentations will be made at 2.30 p.m.

The silver challenge cup and the rescue station and Siebe, Gorman & Company's money prizes will be presented by the Lord Provost of Edinburgh, Sir Ian A. Johnson-Gilbert. Mr. John Wood, general secretary of the Scottish Area of the NUM, will present the union's money prizes, while long-service medallions will be presented by Mr. W. M. S. Cairns, assistant Area general manager of the Lothians Area of the NCB. Mr. H. A. Brechin, vice-chairman of the Heriot-Watt College governors, will be in the chair.

The three judges will be Mr. R. T. Purvis, HM Inspector of Mines (gallery test), Mr. F. H. Morgan, assistant divisional safety engineer, Scottish Divisional Coal Board (oral test), and Dr. J. B. Menzies, assistant divisional medical officer, Scottish Divisional Coal Board (reviver test).

SENIOR FIRST-AID COMPETITION on Saturday of the No. 4 Area (Warwickshire) of the West Midlands Divisional Coal Board was won by Birch Coppice Colliery, which thus repeated its 1959 success. Baddesley Colliery was second, Kingsbury Colliery third, and North Warwick Colliery fourth. Junior competition placings were:—First, Kingsbury; second, Baddesley; third, Birch Coppice; fourth, North Warwick.

South African Colliery Disaster

MESSAGES of condolence from the Queen and Queen Juliana of the Netherlands have been received by the Union of South Africa Government following the disaster at Clydesdale Colliery, Coalbrook, Orange Free State, on January 21. Extensive roof falls entombed 435 miners.

Drilling records were broken in the effort to get through to the buried men. One drill went down 240 ft. in 24 hours—40 ft. more than the previous world record. Nothing like a human voice was heard in reply to calls when a two-way microphone was lowered down the 500-ft. borehole.

The Chamber of Mines in Johannesburg has donated £25,000 towards immediate relief for the dependants of the victims. Britain has given £10,000 to the Coalbrook Relief Fund opened by the High Commissioner for the Basutoland, Bechuanaland, and Swaziland Protectorates. Mr. Abe Moffat, the Scottish miners' president, said on Monday that the Scottish Area of the NUM had decided to send £1,000 to the fund.

On Monday it was announced that union officials would call out the men at Clydesdale unless union demands were met. Mr. Dean Ellis, chief secretary of the Mineworkers' Union, said the union was demanding an inquiry into the application of the Mines and Works Machinery Act and other regulations at four collieries and the suspension of a senior mining official until after the inquiry. Miners at the colliery, he said, were on the verge of a nervous breakdown and did not like the idea of going underground again.

The Miners' International Federation said in London on Wednesday that it is to send Mr. K. H. Saunders, safety and production engineer of the National Union of Mineworkers, as an observer to the inquiries into the disaster.

COAL-PREPARATION PLANT ORDERS IN SOUTH AFRICA

CONTRACTS for two coal-preparation plants have been received by the British General Electric Company (Pty.), Limited, Johannesburg, representatives in South Africa of the General Electric Company, Limited, London, W.C.2. The contracts are worth about £230,000. The Chance sand flotation process will be used in both installations and the plant will be supplied by GEC. The primary screening and conveying sections will be provided by Robins Conveyors (SA), Limited, with whom the GEC has close relations in this class of work.

First plant will be at the Landau Colliery of South African Coal Estates (Witbank), Limited, and will clean 6-in. by ¼-in. raw coal at the rate of 350 short tons an hour. The second, for Natal Navigation Collieries & Estate Company, Limited, will be built at its Kilbarchan Colliery to handle 6-in. by ¼-in. coal at the rate of 320 short tons an hour. The clean coal from this plant will be used solely for steam raising in power stations, but the Landau plant will produce upgraded, sized coal for the domestic market.

Most of the equipment associated with the Chance cleaning sections will be manufactured in South Africa to the designs of the Erith Engineering Works of the GEC, but some will be made at Erith.

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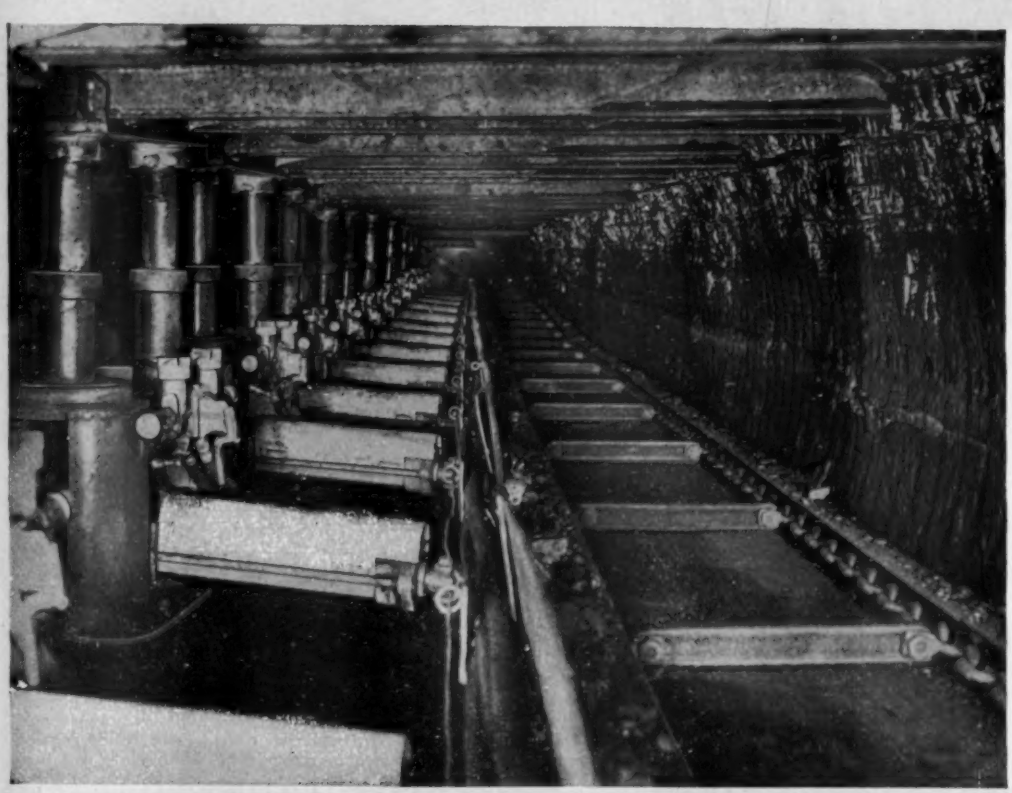

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Mining Qualifications Board Examinations

IN the examinations for certificates of competency, held by the Mining Qualifications Board in November, 1959, 141 candidates were successful in securing first-class certificates. The undermanager's certificate was gained by 74 candidates. There were 117 successful candidates for certificates of qualification as surveyors of mines at the examinations held in November, 1959—January, 1960. At the November examinations there were 27 successful candidates for electrical engineers, 18 for electricians, Class 1, 19 for mechanical engineers, and 10 for mechanics, Class 1.

Lists of successful candidates are printed below under the various examination centres.

First-class Certificates (Mine Managers)

GLASGOW—A. Blair; T. Bowie; A. Boyd; D. G. Dalton; J. A. Duncan; W. Farrell; V. Halpin; P. Kelly; A. D. Kerr; G. M. Lockhart; R. Maxwell; S. K. Mukherjee; R. Murray; W. Nimmo; F. F. Petrie; D. G. Russell; K. Sinclair; Adam Smith; Alexander Smith; D. F. Turner; J. Woods.

SUNDERLAND—J. T. Butterfield; J. L. Craig; C. Dobson; J. Dodds; D. Fennings; D. J. Gillan; M. D. Gleghorn; I. P. Hazra; C. F. D. Johnston; D. Leadley; P. W. Linsley; J. J. Lormor; I. McInnes; J. Morley; G. Proctor; H. Raybarman; R. Sanderson; M. Smithhurst; J. Spraggon; R. Teasdale; P. Thomas; R. N. Thompson; A. W. Wakefield.

DONCASTER—D. Aldersea; J. E. Baker; W. Ball; C. Barnes; M. S. Beeden; P. Blunt; A. Bowers; W. E. Bumstead; J. D. Buxton; R. A. Caunt; F. Cope; R. Davison; M. Deneley; E. Dickinson; A. Dicks; I. D. Dubey; L. Eames; I. W. Farmer; T. Gibson; W. H. Halley; H. J. A. Hazard; D. Holland; V. Hollinworth; H. Hudson; A. T. Johnson; J. L. Jones; T. A. Jones; D. R. Liggett; P. A. Littlewood; E. J. Manshin; T. P. Muldowney; H. Nelson; J. Oxley; C. Piper; P. Plows; J. Roberts; B. Sidebottom; D. H. Singh; G. Smith; J. Smith; J. D. Syson; M. Toole; R. Walker; J. B. Wallace; P. H. Wright.

WIGAN—H. T. Asbridge; J. Bould; M. Dixon; R. Farnall; C. Goulding; G. Hayes; B. A. Jones; J. Jones; D. A. Mitcheson-Lee; T. H. Rhodes; R. Skeldon; W. Swift.

CARDIFF—A. T. Campbell; R. G. Cox; G. A. Evans; H. K. Ghatak; I. E. Harris; K. R. W. Jenkins; E. E. Jones; W. H. Jones; W. J. H. Langley; W. J. D. Marshall; G. G. Parr; R. Pring; W. J. A. T. Pugh; R. D. R. Thomas; W. J. Watkins; E. V. Williams.

STOKE—E. O. D. Agu; J. V. Armishaw; F. N. Barrett; T. Brereton; R. G. Cartlidge; P. D. Colley; J. Cornelius; D. J. Davies; G. T. Dennis; D. Drake; R. S. Evans; F. S. Gill; J. D. Glasby; T. I. Hammersley; C. M. Harmer; R. W. Hawley; J. G. Illsley; R. M. Lander; C. J. Linney; A. S. Mandapaty; J. R. Steel; B. Tatton; A. Turner; P. C. Widdowson.

Second-class Certificates (Undermanagers)

GLASGOW—H. Adamson; J. Ballock; J. M. Cunningham; J. Gratton; W. Hamilton; R. McDougall; P. McInally; T. M. Smith; H. Spence; J. J. Thorburn; J. S. Walker; W. W. W. Wallace.

SUNDERLAND—T. E. Bell; D. Blackett; E. R. Dixon; B. T. Haswell; M. Hill; J. E. Kell; R. Leathard; J. Lyons; J. Proudlock; J. F. Rafferty; N. Robson; A. Rutherford; N. Strangham.

DONCASTER—E. G. Astill; P. Bradwell; C. Burt; W. W. Bryan; L. Connor; O. W. Cooper; E. A. Conley; T. Dickinson; G. F. Froggatt; R. Graham; J. P. Harner; E. Howard; T. L. Lawcock; T. Molley; J. J. Mason; D. Owen; D. Parker; J. C. Parkinson; J. Reeve; F. W. S. Robinson; A. R. Shires; I. B. Singh; R. K. Swain; K. F. Swinscoe; M. T. Wallen; D. Wheldon; J. Wood.

WIGAN—H. Bentley; G. E. Gregson; E. Marsh; K. Moses; E. Oliver; H. Riley.

CARDIFF—I. Davies; R. A. H. Gadsby; I. John; D. J. R. Lewis; R. A. Smarzly.

STOKE-ON-TRENT—J. A. Belcher; S. D. Boote; K. A. Broadhurst; W. O. Cashmore; M. J. Causer; K. B. Harris; R. C. Hollins; R. G. Johnson; G. Lewis; B. Lovatt; A. Tong.

Surveyors of Mines

GLASGOW—J. W. Archer; E. Charnley; W. J. Colligan; J. Coyle; R. Gilbert; W. Holland; A. Horsburgh; J. Hunter; J. Irvine; R. J. Livingstone; R. McCreath; R. McKinnon; J. N. Miller; W. M. Muirhead; R. Murdoch; A. F. Niven; D. Robertson; A. Shanks; H. D. Shepherd; J. T. Thomson; J. M. Walker; R. D. E. Ward; G. T. Williamson; L. Wilson; J. I. Wiseman.

SUNDERLAND—C. S. Barker; A. Barron; D. Burnyeat; R. Cutmore; K. Errington; J. Fryatt; G. T. Hodson; I. Howd; T. Kettle; R. Lumley; K. McKenna; A. F. Meads; O. T. Mulryan; E. Price; W. Price; D. B. Purvis; A. H. Richardson; L. Robinson; M. Robinson; D. Ross; G. E. Simpson; B. Walker; D. H. Williams; L. Willis.

DONCASTER—C. A. Allwood; B. Ashton; P. W. Barke; J. E. Beeden; R. Bradley; J. H. Carrott; H. Count; D. L. Degg; J. Drury; K. R. Eastman; D. Eaton; D. W. Fellows; M. Field; R. Goldthorp; R. Gregory; E. G. Hayes; R. E. P. Heald; R. Humphreys; B. Levitt; M. McNamara; J. W. Poxon; G. R. Prince; A. V. Roper; K. T. Roper; B. W. Rowlinson; R. Savidge; R. B. Scott; S. Sisson; B. F. Stevenson; B. Walker; K. Wheelhouse; L. Whitfield; N. Yates.

WIGAN—J. S. Bailey; J. Banks; J. R. Bond; E. G. Green; K. Marsh; J. K. Minton; L. Morris; M. Morris; M. Whalley.

CARDIFF—D. H. Daily; D. C. David; K. Davies; G. C. Dowling; D. Hatton; J. G. James; D. G. Langley; C. Lewis; J. H. Meehan; B. M. Mitchell; R. Noble; W. Ollerenshaw; C. K. Summers; D. J. Taylor.

STOKE-ON-TRENT—J. A. Brewin; D. J. Cox; D. Evans; W. H. Fisher; J. P. Gannon; D. Jackson; G. G. Martin; J. M. Pratt; E. M. Richmond; T. J. Taylor; G. J. Tranter; P. A. Vincent.

Electrical Engineers

GLASGOW—J. Kennedy; J. Sharp.

SUNDERLAND—R. Currie; J. Ledger; W. Robinson.

DONCASTER—W. E. Briggs; G. Cooper; G. S. Crew; D. L. Groom; R. Hardingham; G. E. Morris; T. O'Donnell; G. R. Parkes; G. K. Raynor; R. Scranage; M. Wilson; D. Lancashire.

WIGAN—P. J. Green; K. W. Keeton.

CARDIFF—L. G. James; R. L. James; C. Robinson.

STOKE-ON-TRENT—E. O. Jones; J. T. Taylor; H. Wagstaff; D. Walkerdine; G. F. Williams.

Electricians, Class I

GLASGOW—Nil.

SUNDERLAND—B. Banton.

DONCASTER—I. J. Anthony; J. Bissett; M. Fowler; J. H. Gross; F. Ibbotson; R. Kaye; E. C. McDonald; L. Straw; D. Watson; B. Williams.

WIGAN—J. Denton.

CARDIFF—W. A. Coombes; N. E. Griffin; E. L. Kinsey; W. Kinsey; R. A. Parker.

STOKE-ON-TRENT—J. G. Brough.

Mechanical Engineers

GLASGOW—G. S. Carlow; F. Greig; J. Stirling; T. K. Wood.

SUNDERLAND—A. M. Askey; J. Fish; F. Hindle; J. J. Walsh.

DONCASTER—B. Booth; C. Gough; C. G. Smith; C. Vaughan.

WIGAN—Nil.

CARDIFF—T. B. Hart; W. Llewellyn; C. Puzey.

STOKE-ON-TRENT—L. Crellin; F. C. Farmer; J. B. Hewitt; W. Stevenson.

Mechanics, Class I

GLASGOW—J. Hamilton; W. M. Morrison.

SUNDERLAND—D. Kerr.

DONCASTER—P. Greasley.

WIGAN—R. F. Parker.

CARDIFF—M. Evans; M. C. Evans; R. M. Jones; D. I. Thomas.

STOKE-ON-TRENT—P. Boon.

SCOTTISH GAS BOARD TO CLOSE CARBONIZING PLANT

FOR economy reasons, the Scottish Gas Board is to close its coal carbonizing plant at Dawsholm gasworks, Glasgow, on April 30. The increased intake of coke-oven gas and the future intake from the Lurgi plant now being built in Fife render the Dawsholm plant uneconomic to continue.

About 150 men work on the plant and their future is being discussed by the board and the unions concerned. A board spokesman said there would inevitably be a degree of redundancy, although it was unlikely to be on a large scale. The question of employing the men at other plants was being considered, he said. The closure of the Dawsholm plant would also release extra manpower needed to operate a new 42-hour week shift-working agreement from May 1.

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AP91

European Coal Output

THE appended figures relating to coal output and imports are taken from statistics issued from Geneva by the Coal Committee of the Economic Commission for Europe.

Tonnages are metric, and the number of underground workers employed relates approximately to the end of the month.

TABLE 1.—*European Coal Output (Metric Tons) and Employment.*

Country.	Output.		Underground employment.	
	November, 1959.	October, 1959.	November, 1959.	October, 1959.
Belgium	1,986,000	2,011,000	92,000	92,000
France	4,950,000	5,334,000	137,000	137,000
Spain	—	1,204,000	—	—
Netherlands ..	1,015,000	1,053,000	30,000	30,000
Poland	—	8,931,000	—	214,000
United Kingdom ..	16,994,000	16,784,000	518,000	521,000
Saar	1,443,000	1,482,000	—	—
Western Germany ..	10,601,000	10,649,000	—	292,000

TABLE 2.—*European Scki-fuel Imports in November, 1959, with Figures for October, 1959, shown in Brackets (Metric Tons).*

Importing country.	Coal and patent fuel.	Coke.	Lignite and brown coal briquettes.
Austria	350,000 (268,000)	59,000 (59,000)	100,000 (87,000)
Belgium	328,000 (371,000)	18,000 (13,000)	8,000 (6,000)
Denmark	331,000 (224,000)	90,000 (116,000)	19,000 (21,000)
Finland	327,000 (256,000)	36,000 (25,000)	— (—)
France	954,000 (948,000)	393,000 (386,000)	40,000 (36,000)
Greece	18,000* (11,000*)	2,000* (1,000*)	— (—)
Eire	155,000* (130,000*)	1,000* (—)	— (—)
Italy	695,000 (658,000)	16,000 (13,000*)	11,000* (11,000*)
Luxembourg	23,000 (21,000)	312,000 (321,000)	11,000 (11,000)
Netherlands	571,000 (538,000)	37,000 (29,000)	25,000 (22,000)
Norway	32,000* (39,000*)	10,000* (24,000*)	— (—)
Portugal	27,000 (30,000)	3,000 (3,000)	— (—)
Sweden	208,000 (191,000)	163,000 (184,000)	4,000 (2,000)
Switzerland	90,000 (100,000)	16,000 (14,000)	17,000 (16,000)
United Kingdom	— (—)	— (—)	— (—)
Western Germany	732,000 (720,000)	39,000 (41,000)	445,000 (500,000)

* Secretariat estimate.

NEW OVERSEA DIVISION FOR F. PERKINS

AN oversea manufacturing operations division has been formed by F. Perkins, Limited, Peterborough. The new division, headed by Mr. K. E. Woollatt, director of administration, will investigate, organize, and advise on oversea manufacturing projects.

Its duties will include close collaboration with Perkins Engines, Limited, the subsidiary responsible for the marketing of Perkins engines throughout the world; investigating and originating manufacturing projects and licensing arrangements in oversea territories; and organizing technical and planning facilities for starting oversea projects.

Fight the Oil Challenge, Miners Urged

MORE than 200 miners, who are members of local authorities in Lancashire and north Wales, were told at a conference organized by the National Union of Mineworkers at Bolton on Thursday of last week to fight for their industry against the increasing challenge of oil. Each miner was given a folder containing information stressing the merits of coal as an economic solid fuel which can be produced in a form fulfilling the conditions of the Clean Air Act.

Mr. Edwin Hall, secretary of the Lancashire Area of the NUM, told them: "These are your documents to fight with. Take them back to your councils. This mad oil policy will strangle this country in the future if it is not controlled now. We cannot afford to depend on imported power for our needs."

In a message, Mr. W. E. Jones, national president of the NUM, urged the miners not to assist the town planners to liquidate the coal industry. "Make sure," he went on, "that your schools, hospitals, libraries, offices, and public and domestic buildings are equipped for the clean combustion of solid fuel."

Mr. T. J. Sales, marketing director of the North-Western Divisional Coal Board, invited local authorities to consult NCB advisers when the heating of new buildings was being considered.

Stable Future Predicted for Coal

THE present recession in the coal industry is being handled very much better than the recession of the 1930s, said Mr. H. J. Widdowson, general manager of the North Staffordshire Area of the West Midlands Divisional Coal Board, last Friday. "We have pruned all our uneconomical output and I feel sure we shall have a very stable mining industry which will compete with anything that is going," he said.

Mr. Widdowson, who was speaking at the annual dinner-dance of Stoke-on-Trent Association of Engineers, went on: "I am extremely proud of my board. It has stocked coal without giving rise to the mass unemployment which took place in the whole of the country between the wars." In the past, Government planners had said that the industry could never produce sufficient coal to meet the needs of the country. "I think you can see why we have been led up the garden path," Mr. Widdowson declared. "Whatever plans the Coal Board made were formulated and agreed by a succession of Governments."

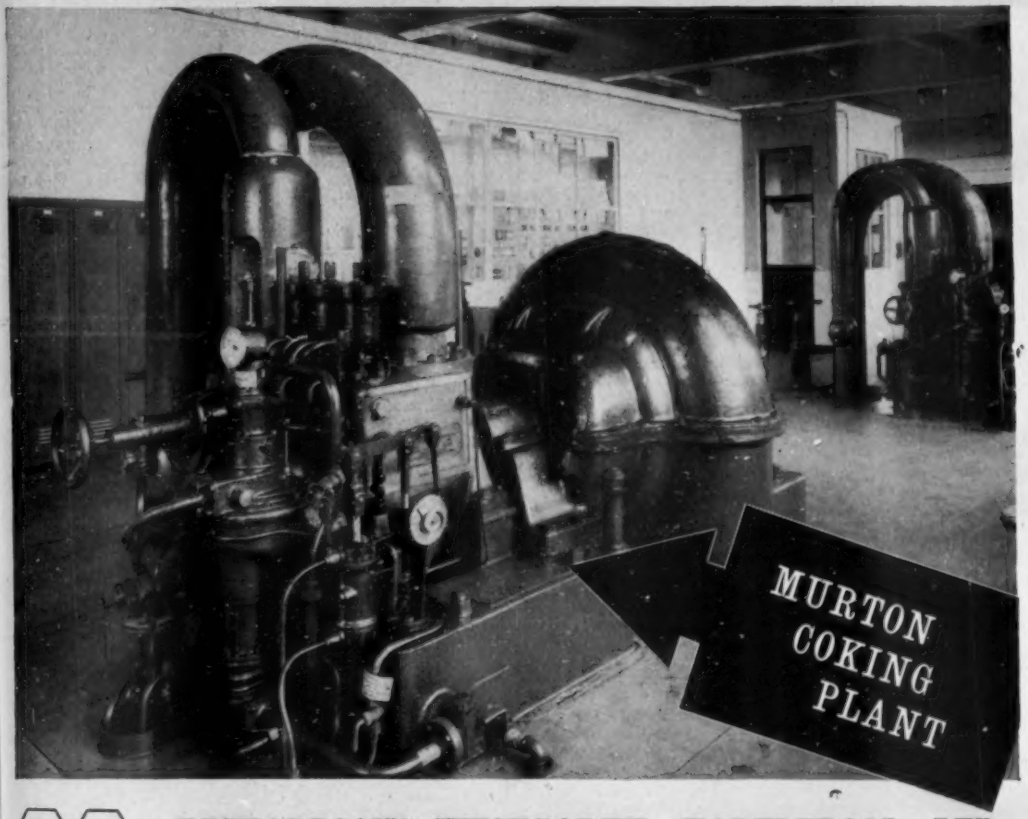
Mr. Widdowson commented on the fact that nine power stations in the country were burning oil when they could use coal which had been stocked.

Rising Production in West Germany

WITH the exception of pig-iron, there was a general increase in production in West Germany in the third week in January. Output of hard coal rose to 2,937,000, raw steel to 462,600 tons, rolled steel products to 216,900 tons, and semi-products to 160,900 tons. Pig-iron production dropped by 2,000 tons to 365,500 tons.

Over the past year the West German steel-processing industry had a combined turnover of DM 2,400,000,000 (over £200,000,000). This compares with DM 2,100,000,000 in 1958. Although turnover has been steadily rising since 1956, there are still some branches of the industry which are showing disappointing results.

The two 2-stage centrifugal type gas exhausters installed in the new Coking Plant of the National Coal Board at Murton, Co. Durham were supplied to the order of Woodall-Duckham Construction Company Ltd., by Richardsons Westgarth (Hartlepool) Ltd. Each having a capacity of 874,000 cubic feet per hour at 30″ Hg. 60°F these exhausters are driven by impulse steam turbines at 6,650 r.p.m. and deliver gas at a pressure of 2 p.s.i.g. from a suction pressure of –15″ w.g.



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February 11, 1960

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Low-phosphorus Iron.—Over 0·10% to 0·40% P, 10-ton lots or over, £23 5s., delivered Birmingham, £23 10s., delivered Grangemouth.

Basic Pig-iron.—Delivered in Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics, 10-ton lots or over, £20 3s.

Hematite.—Si up to 2%, S & P 0·03-0·05%: N.-E. (local iron), £23 19s.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 7s. 6d.; Birmingham, £25 14s.; Wales (Welsh iron), £23 19s., 10-ton lots or over in each case.

Refined.—Cylinder and refined irons, South Zone £25 9s., North Zone £25 6s. 6d. Refined malleable, max. 0·10% P, South Zone £26 9s., North Zone £26 6s. 6d.

MANUFACTURED IRON

(Bar basis, 2½ in. to ¾ in.)

CROWN IRON: England and Wales (Zone 1), £48 10s.; Scotland, £48 5s.; Ireland, f.o.q. Belfast, £50 7s. 6d.; all other Northern Ireland ports, £50 10s., f.o.q. Cable iron, £1 extra.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., 100 tons and over, £31 15s. 6d.; tested, 0·08-0·33% C, 6 to 35 tons, £33 15s. 6d.; hard (0·41-0·60% C), under 10 tons, £34 17s.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting steel up to 0·25% C, under 10 tons, £36 14s. 6d. SIEMENS-MARTIN ACID (under 10 tons): Up to 0·25% C, £41 1s.; silico-manganese, £44 4s.

Billets, Blooms, and Slabs for Forging and Stamping.—Lots of under 10 tons. Basic, soft, up to 0·33% C, £38 10s.; basic, hard, over 0·41 up to 0·60% C, £39 12s. 6d.; acid, up to 0·25% C, £43 4s.; acid silico-manganese, £46 7s.

Alloy Steel (5 tons to under 10 tons).—BILLETS, 3 in., up to and including 10 in., for re-rolling, 0·6/1% Ni, £47 7s.; Ni 2·75/3·75%, Cr 0·5/1·10%, £74 5s.; Ni 2·75/3·75%, Cr 0·5/1·3%, Mo 0·2/0·65%, £84 14s. BARS: 1 in. dia. and up, nickel, £68 10s.; nickel-chrome, £99 4s.; nickel-chrome-molybdenum, £111 17s.

Other Semi-products, etc.—Forging ingots, up to 0·60% C, £31 12s. 6d. f.o.t.; tube billets, under 10 tons, £40 10s.; shell steel billets for direct forging up to and including 0·33% C, 100 tons and over, £37 15s.; tin bars and sheet bars, 50 tons and over, £32 10s. Wire rods, 3g. to 4g. (all areas except Birmingham, Scotland, Southern Joint Area, and Northern Ireland): Soft basic, under 50 tons, £41 2s.; hard basic, under 10 tons, £44 8s.; free-cutting, up to 0·25% C, under 10 tons, £46 12s.; acid, up to 0·75% C, under 10 tons, £54 14s. 6d. Stainless steel billets, 3 in. and over, 5 tons to under 10 tons, Austenitic, £229 10s.; martensitic, £141 10s.

FINISHED STEEL

Heavy Products (1 ton to under 10 tons).—Mild-steel plates, ordinary qualities, N.-E. Coast and Northern Joint Areas and Central Scotland, £41 12s.; medium plates, all areas of England and Wales, £45 1s. 6d.; boiler plates, N.-E. Coast and Northern Joint Areas and Central Scotland, £44 2s.; floor plates, N.-E. Coast, £43 1s. Sections (N.-E. Coast, Midland, and Northern Joint Areas, and Central Scotland): Angles, £38 16s. 6d.; bars (rounds and squares), £41 6s. 6d.; flats, £39 1s. 6d.; joists, £38 12s. 6d.

Rolled and Re-rolled Steel Products.—N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over: Angles and tees, 4 un. in. and under, £40 18s. Channels, 3-in. web and under, £40 18s. Flats, 5 in. wide and under, and rounds and squares, under 3 in.: Untested soft basic, £39 1s.; free-cutting, £45 1s. 6d.; hard basic, £41 19s. 6d.; Siemens-Martin acid, £49 0s. 6d.; spring steel, basic, £44 4s. 6d.; spring steel, acid, £52 19s. Glazing tees, £47 0s. 6d. Sash and casement sections, £43 13s. 6d. Gate channels, £50 17s. 6d. Ferro-concrete bars (10 tons to under 500 tons), £39 10s.

Sheets and Strip.—Uncoated strip mill coils, hot rolled, under 3 mm. to 12g., mill run, mill edge, 25 tons to under 50 tons, £43 16s.; cold reduced, 17/20g., side trimmed, skin passed, £49 16s. Black sheets, 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £68 5s. Cold-rolled steel strip, coils, hard temper, not annealed, 10 tons to under 20 tons, £55 15s. Hot-rolled hoop and strip, u/t soft basic, 100 tons and over, £38.

Tinplates.—Cold reduced, hot dipped, 15 tons to under 50 tons, 66s. 8d. per basis box of 108 lb., f.o.t. makers' works. Cold reduced electrolytic, 59s. 9d. per basis box.

Colliery Rails and Arches.—Arches, 4 in. × 2½ in. × 2 in., re-rolled £39 15s., 3 in. × 3 in., re-rolled £40, 3½ in. × 3½ in., re-rolled £40 7s. 6d., 4 in. × 2½ in. × 2 in., prime £44 6s. 9d. Other sections, prime £44 11s. 9d. Extra fishplates, £52 10s. Cambered girders, 4 in. × 2½ in. × 2 in., re-rolled £38 9s., 3 in. × 3 in., re-rolled £38 11s. 6d., 3½ in. × 3½ in., re-rolled £38 18s. 6d., 4 in. × 2½ in. × 2 in., prime £43 4s. Other sections, prime £43 6s. 6d. Benk bars, standard type, prime material, all thicknesses, £38 11s.; re-rolled, up to ¾ in., inclusive, £37 6s.; over ¾ in., £38 11s. "W" type bars, prime steel, all thicknesses, £41 1s.; re-rolled, up to ¾ in., inclusive, £39 16s.; over ¾ in., £41 1s.

Bright Steel (10 tons to under 20 tons).—Bars, no analysis or test, £52 8s. 6d.; flats, untested, £70 3s. 6d.

High-speed Tool Steel.—Finished bars, 5% cobalt, 10s. 10d.; 14% tungsten, 6s. 11d.; 18% tungsten, 7s. 9d.; 22% tungsten, 9s. 2d.; 4/6 quality molybdenum tungsten, 6s. 3d.; 6/6 quality molybdenum tungsten, 6s. 5d.; 5/6/2 quality molybdenum tungsten vanadium, 6s. 7d. per lb.

Rails, etc.—F.B. rails, heavy, 75 lb. to under 90 lb., 500 tons and over, f.o.t., £39 15s.; fishplates for rails 80 lb. and over, 50 tons and over, f.o.t., £53 11s.; soleplates, f.o.t., 100 tons and over, £51. Light flange rails, 25 lb. and under, d/d N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over, £40 17s. 6d.; fishplates for light rails, 50 tons and over, £50 12s. 6d.

BLAST-FURNACE COKE

(F.O.T. at Ovens)

DURHAM AND NORTH-EAST COAST: 159s. 3d. SOUTH WALES: 158s. NOTTS AND DERBY: 135s. 5d. LANCASHIRE: 146s. STAFFORDSHIRE: 139s. 5d. YORKSHIRE: 138s. 8d. SCOTLAND: 169s. 4d.

(All prices are subject to quality differentials.)

STEELWORKS SCRAP

(Plus 5 per cent. in the case of sales by merchants.)

	Scotland.	N.-E. Coast.	Midlands.	Sheffield.	Lancs.	S. Wales (East)	S. Wales (West)
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Heavy steel scrap* ..	229 3	228 3	220 0	226 3	226 3	227 3	232 3
Heavy mixed scrap*	207 3	206 3	198 6	204 3	203 9	205 3	210 3
Heavy steel turnings†	179 9	179 9	169 9	176 9	174 3	177 0	180 0
Heavy cast iron†	206 9	203 9	208 0	204 3	189 3	199 3	205 9
Cast-iron borings†	160 3	157 3	157 0	159 9	157 3	159 6	164 6

* Basis 500-ton lots in England and Wales and 250 tons and upwards in Scotland, delivered.

† Not less than 250 tons in England and Wales, 100 tons in Scotland.